Physical Characteristics of Commercial Sheet Muscovite in the Southeastern United States

GEOLOGICAL SURVEY PROFESSIONAL PAPER 225

Prepared under a cooperative agreement with the State of North Carolina and the Tennessee Valley Authority

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PHYSICAL CHARACTERISTICS OF COMMERCIAL SHEET MUSCOVITE IN THE SOUTHEASTERN UNITED STATES

By RICHARD H. JAHNS and FORREST W. LANCASTER

ABSTRACT

Most raw muscovite is sold according to requirements specified by the purchaser, and for sheet material emphasis generally is placed on features subject to grading by careful visual examination. Specifications vary with individual end uses, and the chief users of high-quality sheet muscovite ordinarily set very exacting requirements. Correlations between end uses and specifications have not been fully developed for some physical properties of mica, particularly color and clarity. The investigations described in this report were undertaken to provide further basic data that bear on this problem, chiefly by correlation of significant electrical properties of sheet muscovite from the Southeastern States with geographic occurrence, geologic occurrence, and physical characteristics of direct commercial application.

The present project, carried out jointly in 1945 and 1946 by the United States Geological Survey, the State of North Carolina, and the Tennessee Valley Authority, involved the preparation, electrical testing, color identification, and petrographic examination of 2,507 lots containing 237,764 pieces of mica. The test specimens were obtained from at least 850 deposits in the States of Alabama, Georgia, North Carolina, South Carolina, and Virginia. This report includes a general discussion of commercial muscovite in the Southeastern States, together with compilations, descriptions, and discussions of the tests and examinations.

The uses of sheet mica are based upon its perfect cleavage, exceptionally low conductivity of heat and electricity, high dielectric constant and dielectric strength, heat resistance, noninflammability, low dielectric loss, mechanical strength, flexibility, elasticity, transparency, and ease with which it can be worked into final form. A very high proportion is used as electrical insulating material, and during the recent wartime period exceptionally heavy demands for sheet material of superior quality were based upon uses in radio and electronic equipment, aircraft generators and spark plugs, and other electrical apparatus. Such mica must have a power factor (a measure of the loss of electrical energy in a condenser in which the mica is the dielectric) of less than 0.04 percent at a frequency of 1 megacycle.

The preliminary preparation of sheet mica involves separation from other minerals, rough splitting, rough trimming with the fingers, further splitting, and extensive trimming with a knife or other blade. This yields block mica, which is then classified according to size, degree of trimming, and quality. Quality can be classified by visual or electrical means, or by a combination thereof; specifications and methods of test have been published by the American Society for Testing Materials. Block mica generally is further prepared by additional splitting, trimming, and punching or stamping.

The Southeastern States constitute the chief mica-producing area in the United States. Fourteen mining districts have yielded much sheet material, but the bulk of production is derived from deposits in western North Carolina. During the period 1912–44 the Southeastern States accounted for 25,028,404 pounds, or about 54 percent of the total United States production of sheet and punch mica, and its value of $9,720,273 amounted to 62 percent of the total. The average value of the output to January 1945 was about 39 cents per pound, in contrast to the value of 89 cents per pound during the wartime period 1942–44.

The mica-bearing pegmatites range from lenses and stringers less than an inch thick to dikes, sills, and irregular masses several hundred feet long and 200 feet or more thick. In general, the distribution of book mica within a given deposit reflects the shape of the containing pegmatite body, but there appears to be little correlation between the size of the body and the quantity and coarseness of the mica that it contains. Most of the mica concentrations are confined to specific parts, or zones, of the enclosing pegmatite bodies and occur within many of these zones like the shoots of ore minerals in metalliferous deposits. The position and distribution of such shoots commonly can be correlated with the overall shape of the containing zones or with rolls, bends, bulges, constrictions, or other irregularities in these zones.

The results of the color tests of block mica show that material from the Southeastern States covers essentially the entire range known for commercial muscovite. Drab, buff, and brownish ("ruby") mica is locally abundant, but in general the bulk of the sheet material produced from the entire region is green, yellowish olive, or brownish olive. Systematic color variations occur within some mica shoots, within single pegmatite bodies, and within large groups of pegmatite bodies. Variations in individual mica books and within single mica shoots are most pronounced where the muscovite is green or yellowish olive. On a larger scale, brownish books generally are nearer the walls of a given pegmatite body than green ones, and few brownish books occur in those pegmatites with green mica near the walls. Green books are rare in pegmatites with interior concentrations of brownish mica.

A substantial proportion of Southeastern muscovite is mineral-stained, and little of this stain can be effectively removed by even the most careful splitting. In contrast, thicker and larger euhedral inclusions of biotite, apatite, garnet, pyrite and other sulfides, quartz, tourmaline, zircon, zoisite, and other minerals can be removed with little difficulty, leaving holes or distinct depressions in the host muscovite. Various types of curdy greenish or brownish stains and supergene clay, iron, and manganese stains are locally abundant, but air-stained books are very rare.

Iron oxide stains are common in green, yellowish-olive, and brownish-olive micas but are rare in those that are buff and

brown. Thin shreds and wisps of biotite are common in muscovite of nearly all colors. In general, mineral-stained mica is confined to the outer parts of those pegmatite bodies that also contain clear green books and to the inner parts of those that also contain clear buff or brown books.

"Pinholes" are common in most districts but are abundant in the mica from only a few mines. Most of them occur in the brown and buff, or ruby, micas in which zircon and apatite inclusions are most numerous. Hair cracks, said to develop in part after rifting and trimming of sheet mica from certain deposits, are much more abundant in green micas than in the brown and buff varieties.

The results of the electrical tests indicate a general correlation between power factor and physical appearance, but evidently there are numerous exceptions, particularly among stained micas. Nearly all these exceptions are consistent, however, in that the power factor of such mica is lower than that expectable on the basis of visual appearance alone. There appears to be a partial correlation between power factor and the amount of hematite-magnetite stain in sheet mica. On the other hand, many pieces of heavily stained mica evidently possess excellent electrical characteristics, whereas some perfectly clear pieces are inferior in this respect. As far as electrical characteristics are concerned, the best quality of stained mica cannot be distinguished from the poorest quality by ordinary visual means, but much muscovite that contains substantial quantities of iron—either as inclusions, as exsolved intergrowths, or in solid solution—has distinctly less desirable electrical properties than the iron-poor varieties.

Green and brown mottling, "vegetable stain," wispy to platy inclusions of green and brown biotite, and some clay stains that do not transgress the laminae of the host mica appear to have little adverse effect upon its power factor. Neither the color nor the depth of color in clear muscovite appears to have any definite relation to its power factor, and clear green, yellowish-olive, and brownish-olive micas selected by visual means should prove as satisfactory for condenser use as clear buff and light-brown micas. The electrical tests have shown that there is no intrinsic difference, grade for grade, between clear ruby and clear nonruby micas from the Southeastern States and little discernible difference between clear domestic micas and clear material from India.

The use of electrical testing and adoption of the combined visual-electrical system of mica classification proposed by the American Society for Testing Materials should result in upward qualification of much sheet material from the Southeastern States and might well go even farther toward improving the currently inferior position of the abundant greenish varieties in the trade. Electrical testing might also force rejection of some sheets of apparently high quality material, owing to pinholes or other defects difficult to recognize. Determination of power factor alone cannot suffice for the proper classification of sheet mica; hence it should be combined with the results of spark testing and careful visual appraisal.

Electrical testing of much visually classified mica, especially mineral-stained sheets, should result in considerable conservation of condenser-grade material. This may well amount to 50 percent or more. Although such a procedure might be very important and even vital during periods of unusual demand or restricted supply, the increased cost of piece-by-piece or even lot-by-lot electrical testing might not permit competition with other methods of classification during ordinary times. Competition with foreign sources of supply, with ceramic, glass, treated paper, and plastic substitutes, and even with synthetic mica probably will increase as time goes on. On the other hand, improvements in the design of the electrical testing equipment are to be expected, and these devices probably will be adapted to continuous semiautomatic or automatic operation.

INTRODUCTION

GENERAL STATEMENT

Sheet muscovite is used mainly for special electrical installations and equipment, both as simple pieces split from individual crystals and as composite pieces built up from many thin splittings. Most raw mica is graded and classified according to quality, size, and thickness and is sold according to requirements specified by the purchaser. Quality classification is based upon such features as hardness, ease and perfection of splitting, flexibility and elasticity, color, reaction to heating, electrical properties, and amount and distribution of structural imperfections, stain, and inclusions. Emphasis generally is placed upon features subject to qualification by careful visual examination. Classification according to size and thickness is based upon the dimensions of usable material within a given piece of mica.

Specifications vary with individual end uses. It is only natural that fabricators and other purchasers of raw mica should set high quality requirements for specific uses, thereby reducing the proportion of material that conceivably might cause failure in finished equipment. Correlations between end uses and specifications have been developed for some physical properties of muscovite through long periods of trial and careful study, and tolerances are recognized and understood within narrow limits. Little basic or empirical information is at hand for other properties, however, and specifications concerning them appear to be founded upon less certain ground. The setting and maintenance of high acceptance standards for the less fully understood properties of commercial sheet muscovite have made it difficult to determine whether or not so-called inferior types of material are satisfactory for a given use. The effects of color, stain, and inclusions on the electrical properties of muscovite are perhaps least known, and there are serious gaps in the correlation of these with other properties.

In the absence of data that would permit positive assignment of a certain physical feature in a given lot of mica as the cause of an undesirable proportion of failure in finished electrical equipment, any reluctance to lower consumers' specifications is easily understood. On the other hand, the steadily growing demand for muscovite of superior grade, especially during the past two decades, has forced some use of lower-quality mica and even the substitution of other materials. Such conservation measures became a practical necessity because of the unprecedented demand during the recent wartime period, when the entire problem was thrown into sharp relief. The best qualities of mica were allocated only for the manufacture of articles in which no other material was judged usable, and supplies were further conserved by requiring the use of poorer qualities wherever possible, by the use of the smallest possible sizes, by the reduction of waste and the reclamation of partly spoiled material, and by the substitution of ceramics, treated paper, or other insulating substances wherever practicable.

Most of the recent wartime substitution was ordered in great haste and under the stress of expediency, so that much of it was necessarily based upon incomplete and empirical information. Nevertheless, the program of conservation was markedly successful in terms of equipment performance. With a return of peacetime conditions, however, there has been a partial return of higher specifications for raw sheet muscovite. The degree to which this return becomes complete may well depend upon the results of extensive fundamental tests on physical properties, methods of preparation, and methods of grading, classification, and testing carried out by several organizations during the war. Many of these tests were parts of longer research programs that are currently active, but some of the results already have been released in preliminary form.

The question of the suitability of a given piece of muscovite for a given use involves so many variables that no single series of tests seems capable of providing a general answer, but the investigations described in this report were designed to bring together as many types of data as possible. Some significant electrical properties of sheet muscovite from Virginia, North Carolina, South Carolina, Georgia, and Alabama were determined and then were correlated and compared with geographic occurrence, geologic occurrence, and physical characteristics of direct commercial application. The report contains a general discussion of commercial muscovite in the Southeastern States, descriptions of tests made on thousands of specimens, and a discussion of the results of these tests. In the compilation and integration of data on physical properties, emphasis was placed upon factors of economic rather than theoretical significance.

FIELD AND LABORATORY WORK

During the period 1939–46 the United States Geological Survey carried on extensive field investigations of mica deposits in the Southeastern States. The North Carolina Department of Conservation and Development cooperated in this work from July 1941 through the year 1946. The investigations were intended in part to supplement the results of earlier studies by Sterrett[1] and in part to provide new and more detailed coverage of structural, mineralogic, and economic features. The work involved some areal geologic mapping and the examination of 1,644 deposits, more than 400 of which were mapped in detail. Samples of muscovite were collected from stock piles or lots of mine-run material at operating mines, from the walls and backs of mine workings, and from dumps at mines no longer accessible. Most of the mica described in this report was obtained by J. C. Olson during the early stages of the work and, during the later stages, by W. R. Griffitts, E. W. Heinrich, J. E. Husted, W. P. Irwin, R. H. Jahns, F. W. Lancaster, R. W. Lemke, J. M. Parker III, and R. A. Swanson. Where different types of muscovite were recognized in the same pegmatite body, an attempt was made to determine their respective spatial and genetic relations.

Mica collected from 124 mines in 1939 and 1940 was electrically tested by the National Bureau of Standards, and several samples were tested in greater detail by two large fabricators of electrical equipment.[2] Early in 1942 Jasper L. Stuckey, State Geologist of North Carolina, suggested more extensive and systematic investigations that might further define the potential usefulness of Southeastern sheet muscovite as a critical wartime material. Plans were made for electrical testing of samples from many mines, but it was not possible to begin the work at that time.

Late in 1944 the War Production Board issued a directive that only ruby sheet mica should be purchased from domestic producers by the Federal Government after January 1, 1945. The directive reflected the increasingly favorable position of the United States in terms of sheet-mica stocks, but it raised several serious problems. In many instances it proved exceedingly difficult to distinguish ruby from nonruby micas with assurance, and it was some time before a usable definition for "ruby" mica and a procedure for color grading of mica were developed.[3] Moreover, a real need for discrimination between types of commercial sheet muscovite on the basis of color, as implied by the directive of the War Production Board, does not yet appear to have been satisfactorily demonstrated.

The question raised concerning the quality of so-called nonruby mica, which constitutes a large part of the output from the Southeastern States, focused attention more strongly than ever on the need for re-

[1] Sterrett, D. B., Mica deposits of western North Carolina: U. S. Geol. Survey Bull. 315–M, pp. 400–422, 1907; Mica deposits of North Carolina: U. S. Geol. Survey Bull. 430–J, pp. 593–638, 1910; Mica deposits of the United States: U. S. Geol. Survey Bull. 740, 1923.

[2] Kesler, T. L., and Olson, J. C., Muscovite in the Spruce Pine district, N. C.: U. S. Geol. Survey Bull. 936–A, pp. 18–30, 1942.

[3] Judd, D. B., Color standard for ruby mica: Nat. Bur. Standards Jour. Research, vol. 35, pp. 253–256, 1945.

liable correlation between physical properties and commercial classification of sheet material. Plans for a program of mica testing by electrical means were revived and greatly expanded in March 1945, when Jasper L. Stuckey arranged a conference with H. S. Rankin and Charles E. Hunter, of the Tennessee Valley Authority, and R. A. Laurence and R. H. Jahns, of the United States Geological Survey. It was decided at this time that electrical testing of numerous samples of mica representing many different deposits might well establish within reasonable limits the influence of color, staining, and other properties on the electrical behavior of sheet mica.

G. A. Rosselot, of the State Engineering Experiment Station, Georgia School of Technology, was employed as a consultant to investigate previous work of this general nature; he made valuable recommendations based on visits to the Bell Telephone Laboratories in New York City and the laboratories of the Battelle Memorial Institute in Columbus, Ohio, where he discussed the proposed studies with other investigators in the field. Helpful advice and suggestions were also contributed by W. J. Alexander, L. A. Norman, Jr., and Bradley Johnson, of the Colonial Mica Corporation. The North Carolina State College made available the services of F. W. Lancaster for conducting the electrical testing.

The project was carried out jointly by the State of North Carolina, the Tennessee Valley Authority, and the United States Geological Survey during the period July 1945–April 1946. All samples collected by the Geological Survey were studied, and several lots of prepared and qualified mica loaned by the Colonial Mica Corporation also were investigated in detail. The spark-coil test set and the rapid, direct-reading Q-meter developed by the Bell Telephone Laboratories were used for the electrical testing, which was done in Asheville, N. C., during the summer of 1945 by F. W. Lancaster. Careful color determinations were later made by Frances H. Jahns in Asheville and Spruce Pine, N. C., and other physical characteristics were studied by R. H. Jahns. These investigations were completed in the laboratories of the California Institute of Technology, Pasadena, Calif. A total of 2,502 lots containing 237,764 pieces of mica was examined and tested. This material was obtained from at least 850 deposits.

ACKNOWLEDGMENTS

Many members of the United States Geological Survey participated in the collection of samples and the accumulation of basic geologic data on mica deposits, and without their help it would have been impossible to obtain a reasonably complete background for the testing program. It is a pleasure to acknowledge the contributions of W. B. Allen, H. K. Dupree, Edward Ellingwood III, V. C. Fryklund, P. W. Gates, L. Goldthwait, W. R. Griffitts, J. B. Hadley, E. W. Heinrich, F. W. Hinrichs, J. R. Husted, W. P. Irwin, T. L. Kesler, M. R. Klepper, D. M. Larrabee, R. W. Lemke, Roswell Miller III, J. J. Norton, J. C. Olson, J. J. Page, J. M. Parker III, L. C. Pray, L. W. Seegers, R. L. Smith, J. H. Stillwell, W. C. Stoll, R. A. Swanson, and J. R. Wolfe, Jr., in this connection. W. J. Alexander, southern district manager for the Colonial Mica Corporation, drew generously on his broad experience in giving general advice and in commenting upon the results of the tests. He also provided facilities and equipment on several occasions and expedited the investigations in many other ways. Helpful suggestions and comments were made from time to time by Bradley Johnson, Adrian Newhouse, and L. A. Norman, Jr., of the Colonial Mica Corporation.

The chief organizers of the project, J. L. Stuckey and H. S. Rankin, retained an active interest from its inception to its close and were primarily responsible for the planning, financing, and successful completion of most phases of the work. C. E. Hunter, of the Tennessee Valley Authority, contributed many helpful suggestions; Jane Anderson, of the North Carolina State Department of Conservation and Development, compiled most of the electrical-testing data; and L. L. McMurray, superintendent of the Asheville laboratories, North Carolina State College, aided greatly in compiling and checking the electrical and other data for table 10. Frances H. Jahns assisted in the sorting and classification of samples, in the determination of several physical properties of the muscovite, and in the final preparation of the manuscript. The technical assistance of Ida M. Morgan, Madeline F. Harding, Joan T. Rounds, and Louis Reeder also is gratefully acknowledged. The report was critically reviewed by H. S. Rankin and J. L. Stuckey and by E. N. Cameron and L. R. Page, of the United States Geological Survey.

Mine owners and operators were uniformly cordial and cooperative throughout the investigations. Permission to collect samples for purposes of examination and testing was granted freely and consistently. H. A. Knight, of High Point, N. C., was particularly helpful in lending nearly 200 pounds of prepared electric (stained sheet) mica for detailed testing, and he generously permitted the retention of a portion of this material as a reference sample. Smaller lots of commercial muscovite were loaned or donated by other mine operators as well.

COMMERCIAL SHEET MUSCOVITE

GENERAL PROPERTIES

Minerals of the mica group are complex aluminum silicates whose outstanding characteristic is an almost perfect basal cleavage. In the true micas this

TABLE 1.—*Theoretical composition of muscovite, compared with composition of specimens from several localities*

		Composition of specimens				
	Theoretical composition	Hiddenite mine, Alexander County, N. C.[1]	Miask, Ural Mtns., Siberia [2]	Bengal, India [3]	Auburn, Maine [4]	Harding mine, Taos County, N. Mex. [5]
SiO_2	45.2	45.40	44.17	45.57	44.48	44.80
TiO_2	----------	1.10	----------	----------	----------	----------
Al_2O_3	38.5	33.66	37.35	36.72	35.70	37.72
Fe_2O_3	----------	2.36	1.29	.95	1.09	.67
Mn_2O_3	----------	N.d.	N.d.	N.d.	N.d.	.21
FeO	----------	----------	.20	1.28	1.07	N.d.
MnO	----------	----------	.10	N.d.	N.d.	----------
MgO	----------	1.86	----------	.38	Trace	None
CaO	----------	----------	----------	.21	.10	----------
K_2O	11.8	8.33	10.00	8.81	9.77	10.66
Na_2O	----------	1.41	1.14	.62	2.41	1.40
Li_2O	----------	Trace	----------	.19	Trace	Trace
H_2O	4.5	5.46	5.73	5.05	5.50	4.52
F	----------	.69	.90	.15	.72	.20
Total	100.0	100.27	100.88	99.93	100.84	100.18
O correction	----------	.29	.37	----------	----------	.08
Corrected total	----------	99.98	100.51	----------	----------	100.10

[1] Clarke, F. W., Analyses of rocks and minerals from the laboratory of the United States Geological Survey: U. S. Geol. Survey Bull. 591, p. 330, analysis D, 1915.
[2] Idem, analysis E.
[3] Dana, E. S., The system of mineralogy of James Dwight Dana, p. 617, analysis 1, 1909.
[4] Idem, analysis 6.
[5] Schaller, W. T., and Henderson, E. P., Purple muscovite from New Mexico: Am. Mineralogist, vol. 11, p. 12, 1926.

cleavage permits splitting into thin sheets, laminae, or films that are tough, flexible, elastic, and extremely low in electrical and heat conductivity. In contrast, the clintonites (or "brittle" micas) and the chlorites yield cleavage sheets that are brittle and inelastic. The true mica group includes several species, one of which is muscovite, or potassium mica. Biotite contains iron and magnesium, and phlogopite contains magnesium and a little fluorine. Among the other species are lepidolite, a lithium mica; zinnwaldite, a lithium-iron mica; and roscoelite, a vanadium-bearing iron-magnesium mica. Sodium, barium, manganese, chromium, titanium, and other elements are minor, generally rare constituents in the group. All micas yield water upon ignition; ordinarily this amounts to 4 or 5 percent of the molecule.

Muscovite is the only true mica that is sufficiently abundant in the Southeastern States to be of present commercial importance in sheet form, and the discussions of mica in this report are therefore devoted to this species alone. In general it is an orthosilicate of aluminum, potassium, and hydrogen, with the theoretical composition shown in table 1. Analyses of specimens from five localities are included in the table for comparison. Muscovite is chemically very stable and is little decomposed by weathering or by ordinary acids in the laboratory. It is said to yield water, however, when heated to temperatures above 400° C.,[4] and in some varieties this change is accompanied by swelling and loss of elasticity and transparency.

[4] Horton, F. W., Mica: U. S. Bur. Mines Inf. Circ. 6822, p. 6, 1935 (revised 1941).

Muscovite crystallizes in the monoclinic system but is nearly hexagonal in symmetry. Much commercial mica occurs in rough crystals or "books," some of which are partly or completely bounded by poorly developed faces. The books generally are tabular to equant, with their shortest dimension perpendicular to the cleavage direction. Some are elongated normal to the cleavage direction and are characteristically tapered; many of these are distorted by slippage along the cleavage planes and are known as "step crystals." Most well-developed crystals are hexagonal or rhombic in outline, with six or more faces forming the margins of cleavage pieces (pl. 1). The simplest forms comprise basal, prismatic, and clinopinacoidal faces (fig. 1), but modifying faces are common. As ob-

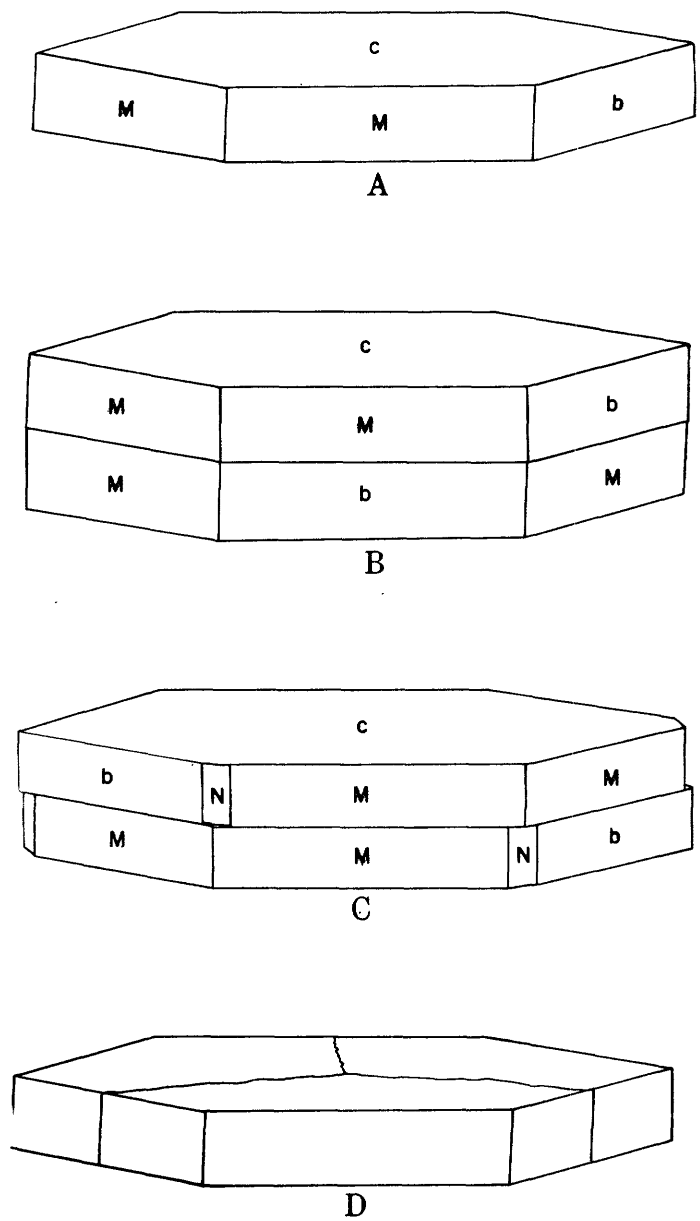


FIGURE 1.—Typical crystals of muscovite, showing the most common faces: c, base; M, prism; b, clinopinacoid; N, prism. *A*, Simple crystal; *B*, *C*, and *D*, Twinned crystals.

served on a cleavage surface or basal face of a crystal, the traces of the prismatic and clinopinacoidal faces meet at angles of almost exactly 120°. Twinning is common, chiefly with the crystals united along the base or along irregular surfaces nearly perpendicular to the base (fig. 1).

The symmetry of muscovite crystals is clearly shown by percussion figures. If a cleavage plate of sheet mica is struck sharply by a blunt punch or large needle with a dulled point, a partial or complete six-rayed pattern of cracks is developed. Individual rays of this percussion figure extend outward from the point of impact, and their orientation is constant regardless of where the mica piece is struck (pl. 1). Two of the cracks, generally deeper and longer than the other four, intersect the cleavage surface to form a single line parallel to the trace of the clinopinacoidal face (fig. 2). The others form two lines that meet

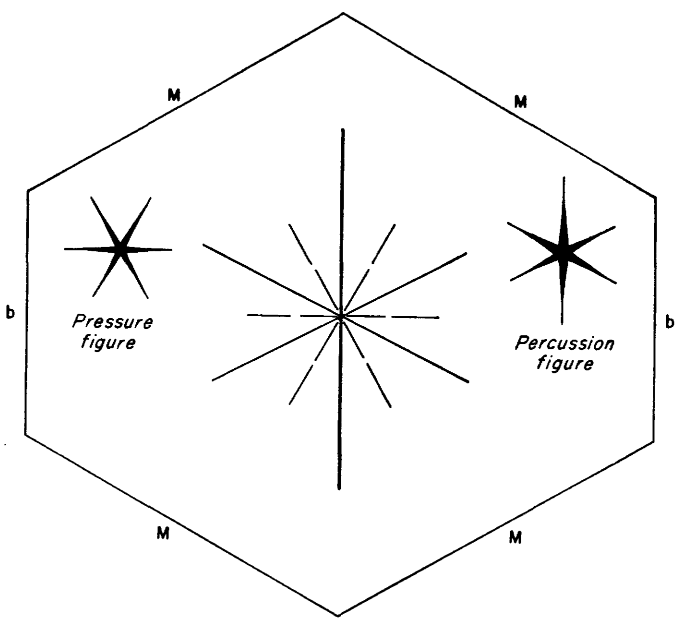


FIGURE 2.—Pressure and percussion figures in muscovite, showing orientation with respect to the prismatic (M) and clinopinacoidal (b) faces.

at angles ranging from less than 53° to nearly 56° and are nearly parallel with the trace of the prismatic faces.[5]

A second type of figure can be developed by firmly pressing a dulled point against the piece of mica, particularly if the mica rests on a flat but elastic surface. Like the percussion figure, this pressure figure is six-rayed wherever complete, but only two or three rays are commonly developed. Some pressure figures are formed simultaneously with percussion figures, and the two have common centers. One set of cracks is perpendicular to the trace of the clinopinacoid and hence perpendicular to the principal direction of the percussion figure (fig. 2). The others are perpendicular to the prism faces and therefore do not bisect the angles between the rays of the percussion figure. The cracks of the pressure figure coincide with distinct glide or parting planes in the crystal and meet the cleavage planes at an angle of about 67°. Both percussion and pressure figures are very useful in determining the crystallographic orientation of mica books, especially where no crystal faces are present. In this report the orientations of other features are generally described in terms of percussion- and pressure-figure directions, which serve as convenient references.

Muscovite is transparent and nearly colorless when split into thin sheets, but most thick plates are distinctly colored in shades of green, brown, yellow, orange, and pink. Phlogopite, the other mica commonly used as an electrical insulator, is yellow, golden brown, dark brown, or black; much of it has a coppery, translucent appearance, and in general it is less transparent than muscovite. Freshly cleaved fragments of muscovite have a hard, brilliant luster, in contrast to the dull, rough surfaces of most books. The mineral ranges in hardness from 2.0 to 2.5 and is easily cut by a knife. In general the hardest books are the least flexible; commonly they can be split only with difficulty. The specific gravity of muscovite ranges from 2.76 to 3.00.

Many muscovite books are intergrown with biotite or enclose smaller biotite crystals, and some muscovite occurs as well-crystallized inclusions in books of biotite. The cleavages of the two micas generally are parallel. Inclusions of magnetite, hematite, and goethite occur in the muscovite of some deposits, commonly as latticelike crystals or crystal aggregates that are distributed in accordance with the crystal directions of the host mineral. Such inclusions are so abundant in some books that thin cleavage pieces of the mica are opaque or nearly so. Apatite, garnet, quartz, zircon, tourmaline, and many other minerals also occur as inclusions within or between the mica laminae.

PROPERTIES AFFECTING VALUE

CLEAVAGE

The edges of most crystals or books of muscovite are twisted, crushed, tangled, and irregularly intergrown with other minerals and hence must be cut away before the remaining material can be split into films or thin sheets. Owing to their elasticity, strength, and almost perfect basal cleavage, undistorted books or parts of books readily yield films less than one-thousandth of an inch (1 mil) thick. Films that are uniform in thickness and have flat or very nearly flat surfaces are commercially the most desirable. Their

[5] Walker, T. L., Observations on percussion figures on cleavage plates of mica: Am. Jour. Sci., 4th ser., vol. 2, pp. 6–7, 1896; Sterrett, D. B., Mica deposits of North Carolina: U. S. Geol. Survey Bull. 740, p. 12, 1923.

value increases with their size, and the rate of increase is greatest in the largest sizes. Book mica that yields such films is said to be free splitting. The films can be easily tested for constancy of thickness by means of machinist's or dial micrometers or by placing them between crossed polaroids and observing whether uniform interference colors are obtained.

Some mica does not split uniformly, but tears into irregular partial films. Such material may split evenly and easily in some places but very imperfectly in others. It is known in the Southeastern States as "locky," "gummy," "tangled," "tanglesheet," "tanglefoot," or "tacky." The designation "tanglesheet" is also applied to coarse aggregates of irregularly intergrown books, which commonly form masses of "bull" mica several feet in maximum dimension. Discontinuity of cleavage, or lockiness, generally is caused by a partial intergrowth of books or of laminae in a single book (fig. 3), by internal distortion of the book, by finely divided inclusions, or—rarely—by twinning with composition planes nearly normal to the base (fig. 1). Many locky books do not differ markedly in appearance from those that split freely and evenly.

The hardest varieties of muscovite commonly are more difficult to split than softer varieties, but numerous exceptions are known. Many very dark varieties also are not free splitting, but others yield large, uniform sheets. There appears to be some correlation between the lockiness of Southeastern micas and the presence of disseminated flakes, shreds, and very thin plates of biotite and chlorite—especially in the hard brown, brownish-olive, or buff micas—but more detailed microscopic study is needed to demonstrate the mechanism and consistency of this relation. The effects of larger inclusions are clearer. Prismatic crystals of apatite and quartz, for example, commonly lie nearly normal to the mica cleavage and hence are like nails driven through a series of thin boards (fig. 3). Such mica is said to be "tied," "nailed," or "naillocked." Similar tying is accomplished by small elongate crystals of muscovite that are oriented obliquely to the host crystal (fig. 3).

HARDNESS, FLEXIBILITY, AND ELASTICITY

The hardness of Southeastern mica varies from one deposit to another, less commonly from one book to another, and in some instances within a single book. In general the brown, cinnamon-brown, and buff micas are harder than the greenish-olive and green varieties in the Southeastern States. Where other factors are equal, the hardest varieties are the least flexible and consequently are among the most difficult to split. Relative degrees of hardness are easily determined by judging the ease with which sheets of known thickness can be cut, by bending them slightly, or by tapping them against a thick piece of wood or a knuckle of the hand. Pieces of very hard mica sound like glass when shaken together.

Flexibility and elasticity are important properties, especially in mica that must be bent sharply without breaking or must be exposed to unusual jarring or vibration. To meet most commercial specifications a sheet of mica 0.005 inch (5 mils) thick must return promptly to its normal planar condition after being wrapped around an ordinary lead pencil and then released. Flexibility and elasticity are most seriously affected by cracks, holes, and other structural defects. Most of these are easily recognized, but some extremely thin and fine cracks commonly escape detection. These are known as "hair cracks" or "hair lines." Films of mica in which some laminae are haircracked generally fail when bent, especially if the flaws are abundant or if they extend through considerable thicknesses of the films. Such mica is termed "brittle."

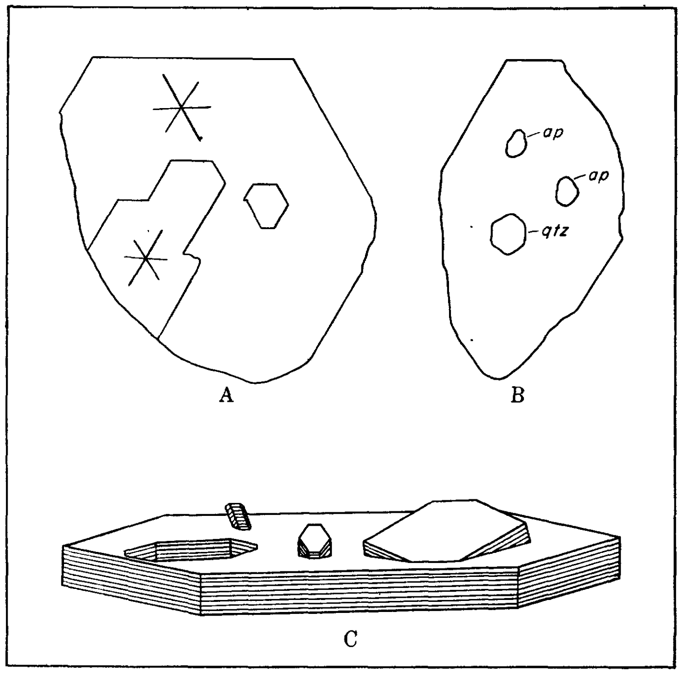


FIGURE 3.—Inclusions in muscovite. *A*, Intergrowth of muscovite in muscovite. Orientations of sheets are shown by percussion figures. *B*, Inclusions of apatite (ap) and quartz (qtz) in muscovite. *C*, Locking inclusions of muscovite in muscovite. The cleavage planes of the inclusions are not parallel with that of the host crystal.

Where exposed to the weather for long periods, muscovite loses its luster and gradually becomes soft, pliable, and "punky." This weathering is chiefly a mechanical process involving the separation and splitting off of cleavage laminae by moisture, temperature changes, and vegetation, acting either singly or in combination. Some chemical attack by organic acids and possibly by other acids as well reduces many of the separate laminae to lusterless, opaque, crumbly flakes. Any inclusions of magnetite or hematite that are present in such mica generally are altered to hydrous iron oxides.

STRUCTURAL IMPERFECTIONS

Perfection of cleavage is of fundamental importance in governing the usefulness of sheet muscovite, but the size and flatness of sheets obtainable from mica books are limited by several other structural features as well. Chief among these are "reeves," "wedging," "warping," and "ruling."

"Reeves," or "cross grains," are lines, striations, shallow corrugations, or small, narrow folds that lie in the plane of cleavage. Some reeves are simple, closely spaced flexures or crenulations, presumably caused by stress during or after crystallization of the mica. Others, however, are formed by discontinuities in incomplete sheets or laminae. As traced across a mica book, such laminae die out abruptly along straight lines but commonly reappear along parallel straight lines beyond. Where the distance between lines is very small and the space from which the laminae are missing is accordingly narrow, the reeves appear only as fine lines, but where laminae are missing over greater distances the spaces are occupied by adjacent laminae warped downward from above and upward from below. Such reeves are thus a combination of corrugations and the edges of incomplete laminae (fig. 4). Their depth is a function of the number of missing laminae, and their spacing is a function of the distribution of discontinuities in the laminae. The edges of some incomplete sheets are flanked by series of narrow ribbons or strips, and the reeves in such mica are very closely spaced (fig. 4).

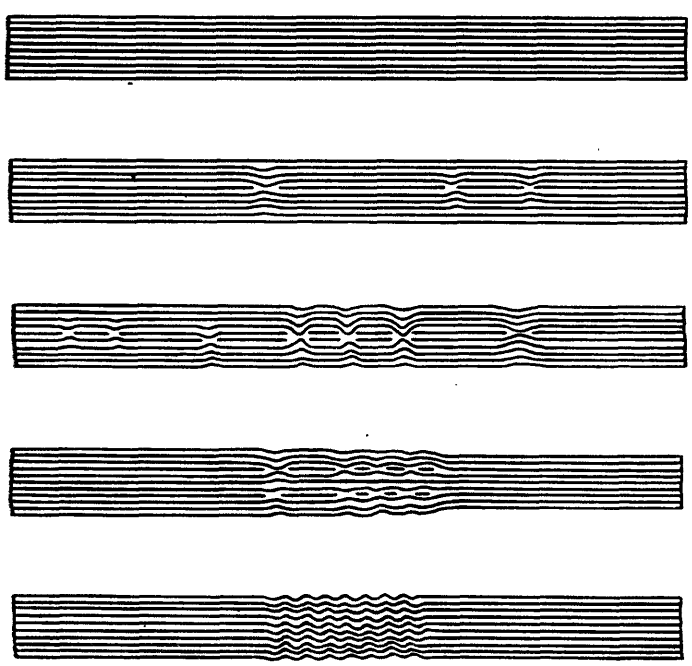


FIGURE 4.—Diagrammatic sections, showing the relation of distribution and depth of reeves to crenulations and discontinuities in muscovite laminae.

Reeves are specifically oriented with respect to crystallographic directions in the mica. They are perpendicular to the trace of the prismatic and clinopinacoidal faces and hence are parallel to the rays of the pressure figure. "A" ("housetop," "fishtail," "V-ridge," or "spearhead") mica is distinguished by two series of reeves that intersect at an angle of about 60°. The third series necessary to complete the "A" is not present, so that the structure actually resembles the letter "V." Typically a single pair of "A" reeve groups extends across an entire mica book, with the point of the "A" very near one edge (pl. 2). Such books rarely show well-developed crystal faces.

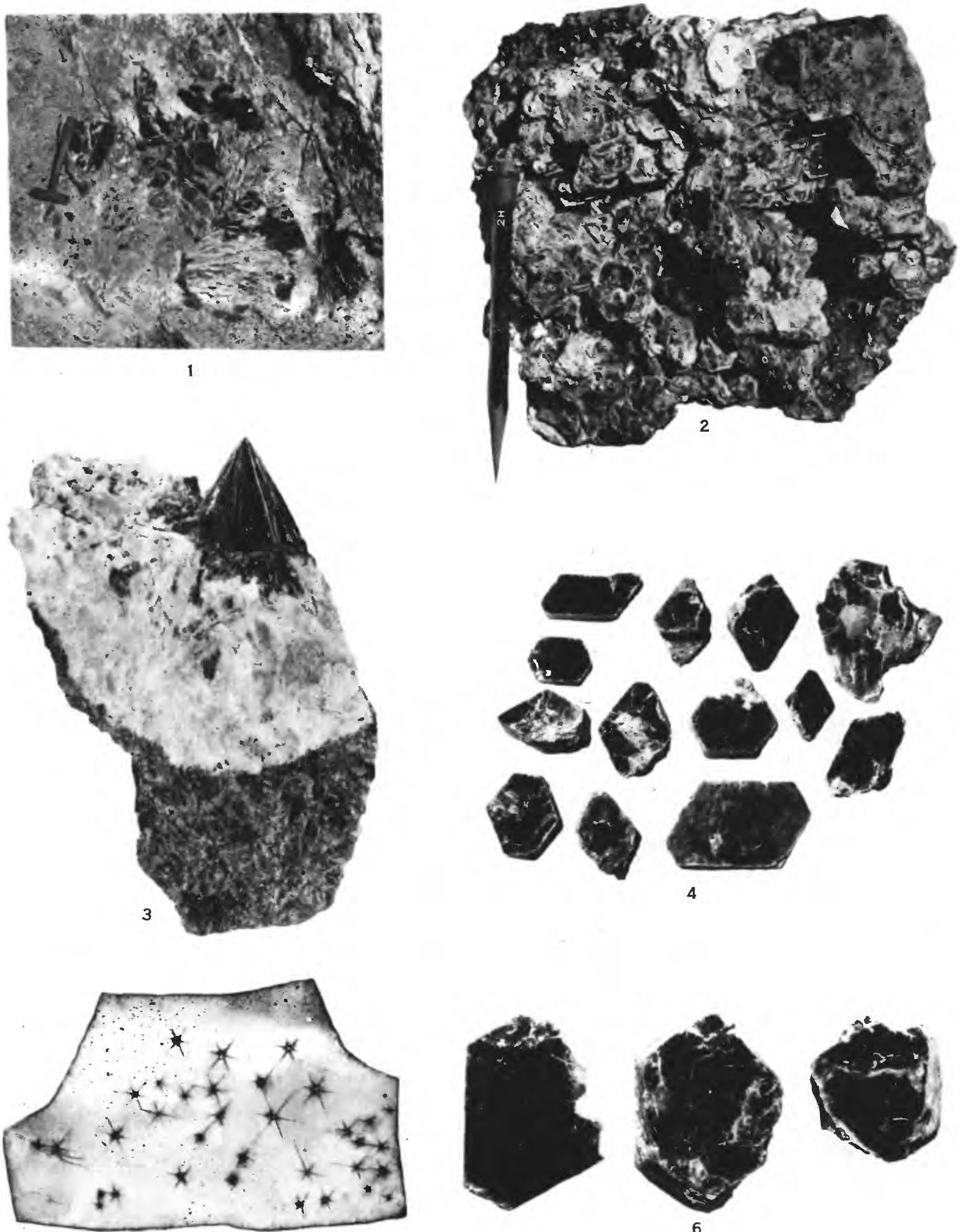
Three directions of reeves are present in "double-A" mica, and their pattern suggests two pairs of "A" reeve groups with a common point and a common side (pl. 2, no. 6). The relation of "A" structure to crystal directions is best shown in books with reeves that extend in six directions from a common center. In describing such a book from the Marie mine, Spruce Pine district, N. C., Kesler and Olson [6] state that "a complete six-sided crystal, 2.5 inches in diameter, was divided at intervals of 60° by typical 'A' reeves into six parts like the pieces of a pie, the reeves diverging from the center, and each set bisecting the face of the mica crystal." Books with only one pair of "A" reeve groups thus can be considered as highly distorted crystals representing little more than one-sixth of a perfect crystal of flat mica (fig. 5).

Some "A" books in which the imperfections are shallow, widely spaced, or otherwise not seriously developed can be split into sheets of commercial value. "A" structure is developed only near the edges of other books (pl. 2, no. 3), and flat sheets of good quality can be split from their inner parts after the reeved material is trimmed away. Very large trimmed sheets have been obtained from such "flat-A" mica in many Southeastern mines. In still other mica the reeves are confined to certain sheets or groups of sheets, so that

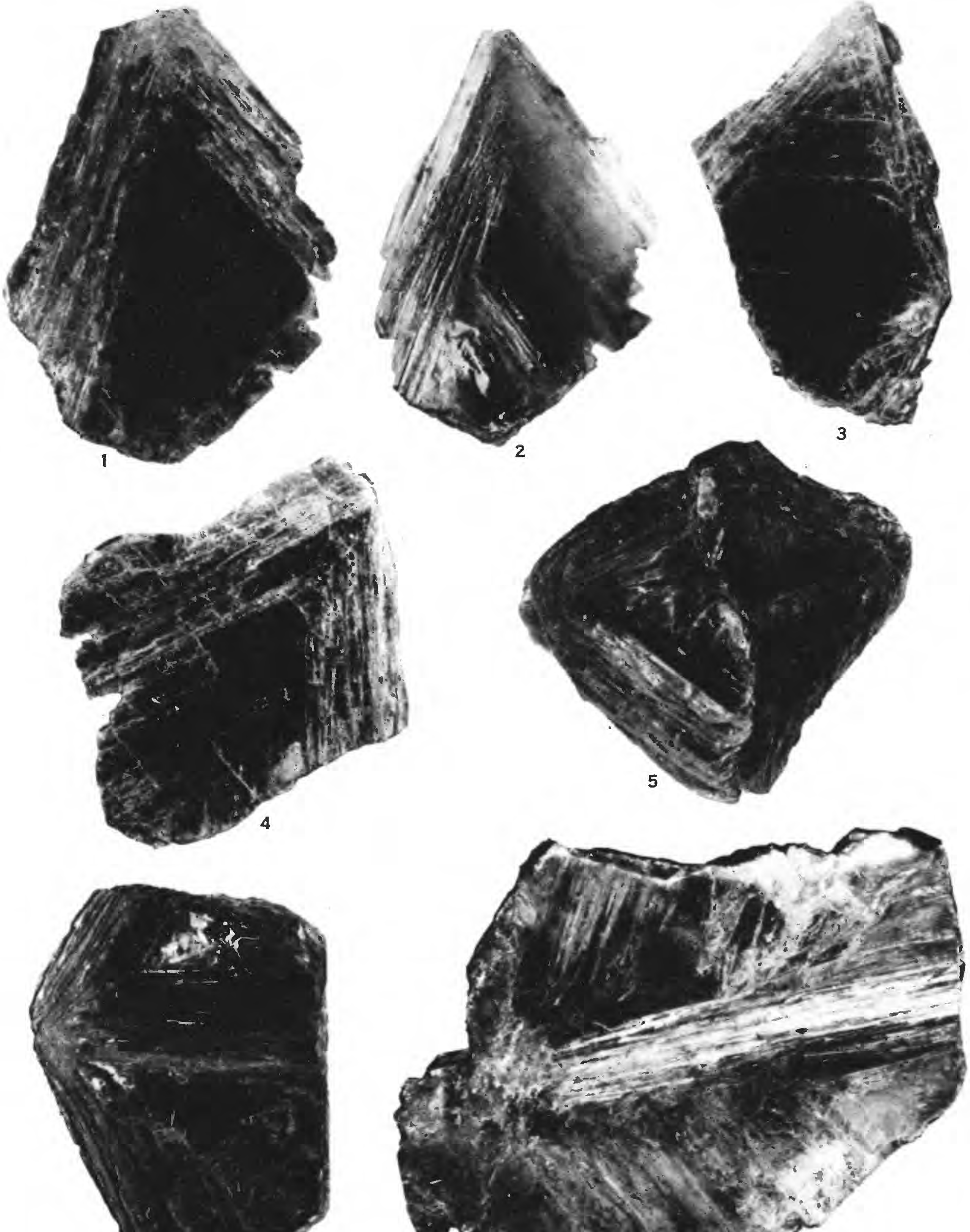
[6] Kesler, T. L., and Olson, J. C., Muscovite in the Spruce Pine district, N. C.: U. S. Geol. Survey Bull. 936–A, p. 14, 1942.

EXPLANATION OF PLATE 1

1. Cluster of books with poorly developed crystal faces. The muscovite is locally intergrown with white albite.
2. Parallel growth of small, well-developed crystals.
3. Single wedged book and associated irregular books of much smaller size in plagioclase-quartz pegmatite. One-fourth natural size.
4. Books with somewhat irregular crystal faces. One-inch square gives scale.
5. Percussion figures in trimmed sheet. One-half natural size.
6. Books with smooth to very rough crystal faces. One-half natural size.



BOOKS AND CLEAVAGE PIECES OF MUSCOVITE



REEVE STRUCTURES IN MUSCOVITE

imperfect material can be split out and good sheets obtained from the remainder of the book. Much "A" mica, however, is so seriously marred that it must be classed as scrap.

"Herringbone" ("fishbone," "fishback," "feather," or "horsetail") mica is marked by reeves and hence is somewhat similar in appearance to "A" mica; however, the angle of intersection of the reeve groups is about 120°, rather than 60°. The reeves characteristically flank a central line or strip of reeves to form a pattern resembling that of a feather or the skeleton of a fish (pl. 2, no. 7; fig. 5). The central line or strip generally is perpendicular to the trace of the clinopinacoidal crystal face. Few herringbone books from deposits in the Southeastern States contain flat material; hence nearly all are processed as scrap.

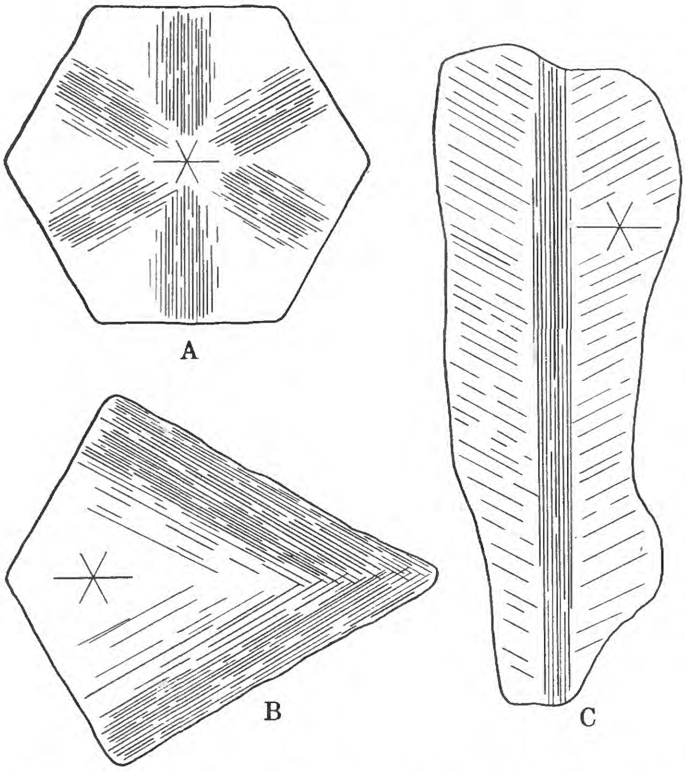


FIGURE 5.—Relation of reeves to crystal directions in muscovite. Orientations are shown by percussion figures. *A*, Complete directional development of "A" reeves in crystal; *B*, Typical development of "A" reeves; *C*, Typical herringbone reeves.

Combinations of "A" and herringbone structures occur in some books, particularly those of the flat-A type. The herringbone reeves generally are discontinuous and irregularly distributed in such mica. Books not marred by "A" or herringbone structure commonly contain a single set of reeves. If the reeves are thin and fine, the material is sometimes referred to as "hair-lined." Such reeves are not to be confused, however, with the true hair lines and hair cracks previously discussed.

"Wedge" structure, or "wedging," is caused by the interlayering of sheets of unequal size. Some extend entirely across the book, whereas others taper out at intermediate points. Books in which incomplete laminae extend inward from all edges can be externally regular in shape, but owing to their complex internal wedging they yield no sheet mica. Books in which a preponderance of incomplete laminae extends inward from one edge are markedly thicker on one side than on the other (pl. 3). Wedge structure is common in herringbone and "A" micas, and the term "wedge-A" is used in contradistinction to "flat-A." Herringbone and most wedge-A books consist almost wholly of scrap, whereas many flat-A books contain appreciable quantities of sheet material.

Not all wedged mica is marked by reeves, and Sterrett[7] states that in plate mica the difference in thickness on opposite edges may be greater than half an inch in a crystal 3 inches in diameter. The amount of wedging generally is greater in reeved than in unreeved mica, however, and wedge angles of 25° or more are common in "A" books. Small, thickly wedged "A" books are known as "chub-A" (pl. 3, no. 5).

"Ribbed," "rippled," "ridged," or "creped" mica is marked by waves or ridges, generally shallow, that are not assignable to "A" structure or to other reeve groups. Unlike reeving, most ribbing and rippling appear to be the result of deformation of the mica after, rather than during, crystallization. Some ripples are traceable along their strike into broad warps, some may be traced into fractures or partings, and others die out abruptly (pl. 3). Still others extend across entire cleavage surfaces without marked change in size. In general these minor warps or crenulations are spaced much farther apart than typical reeves, and good sheet material can be recovered from parts of many rippled books. Sheets that are only slightly affected are termed "wavy," and mica that is bent on a broad scale is said to be "buckled," "warped," or "cupped." Many types of deformation occur, and all gradations are known between flat

[7] Sterret, D. B., Mica deposits of the United States: U. S. Geol. Survey Bull. 740, p. 16, 1923.

EXPLANATION OF PLATE 2

1. Flat-A mica. One-fourth natural size.
2. Severely reeved mica, split from same book.
3. Flat-A or broad-A mica, with reeves near edges only. One-fourth natural size.
4. "A" mica with widespread development of reeves. One-fourth natural size.
5. Partial intergrowth of two books of "A" mica. One-half natural size.
6. Double-A structure, with flat material between reeve groups. One-half natural size.
7. Herringbone structure in somewhat clay-stained mica. Two-thirds natural size.

and severely buckled mica (fig. 6). An extreme example of deformation is the chevronlike folding of some mica books in the Meadow deposit, Spruce Pine district, N. C. (pl. 3, no. 10). Another type of folding, known as "cleavage stepping," comprises small, sharp monoclinal flexures. These are subparallel, and they typically distort the cleavage faces into series of broad, low steps (pl. 3).

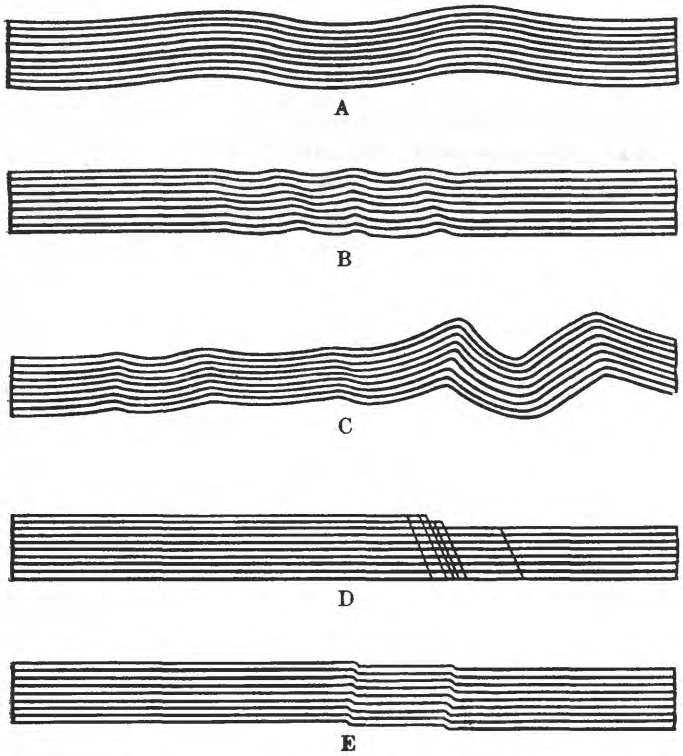


FIGURE 6.—Diagrammatic sections, showing deformation of muscovite laminae. *A*, Broadly warped, or wavy, sheets; *B*, Warped or rippled sheets; *C*, Gradation of warped mica into buckled or folded mica; *D*, Mica cut by parting planes (ruling); *E*, Cleavage-stepped mica.

One of the commonest structures in mica books is "ruling," or "secondary cleavage," which occurs as regular, sharply defined parting planes that intersect the basal cleavage plane at an angle of nearly 67°. They are parallel to the pressure figure. Only one set of these partings is present in many books, but two or all three sets occur in others. Their traces on cleavage surfaces intersect at angles of about 60°, and where all three sets are present they commonly separate the sheets into triangular or hexagonal fragments (fig. 7). Many sheets ruled in two directions are similarly separated into rhombic or diamond-shaped fragments or into strips and laths.

The structure generally continues through the entire thickness of severely ruled books, but in others it is confined to certain layers in which it may extend partly or entirely across the cleavage faces (pl. 4). Where one set of ruling planes is well developed, the mica is thereby separated into strips or ribbons that commonly are less than an inch wide. The ruling in some mica is so closely spaced that individual ribbons are sliverlike or hairlike (pl. 4, no. 3). Accumulations of such slivers are termed "hair mica." Ribbons in some large books, on the other hand, are as much as 4 or 5 inches wide and hence yield satisfactory sheets if free from other defects. Ruling appears in much "A" and herringbone mica, where it either coincides in direction with the striations and corrugations or forms the cross bar of the "A" (pl. 4, no. 4). It is more common, however, in unreeved books, where its distribution is of prime importance in determining the sizes of sheets that can be trimmed out.

Ruling, warping, buckling, and rippling are most intense in books that occur near faults or slip joints and plainly are the result of distortion from post-crystallization movements. Both percussion figures and ruling are strongly developed in some books that lie near blast holes, where they appear to have been formed by the shock of the blasting. Such ruling generally occurs in small hexagonal or rhombic patterns (fig. 7).

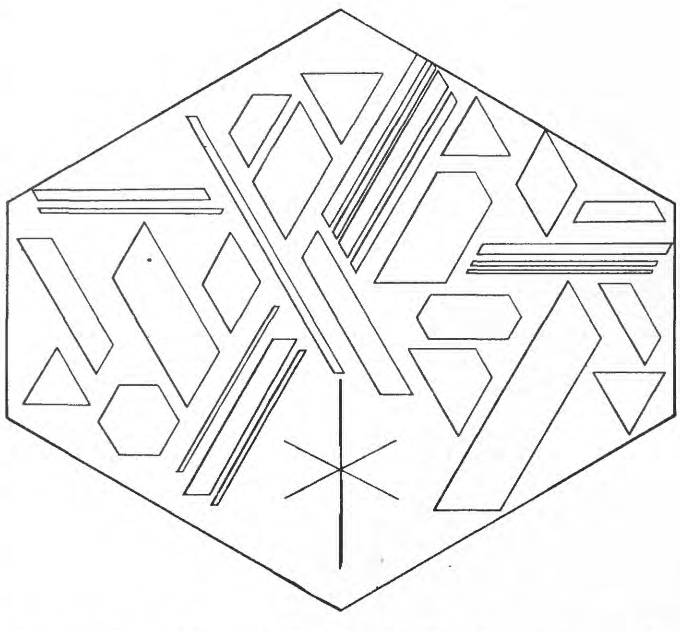
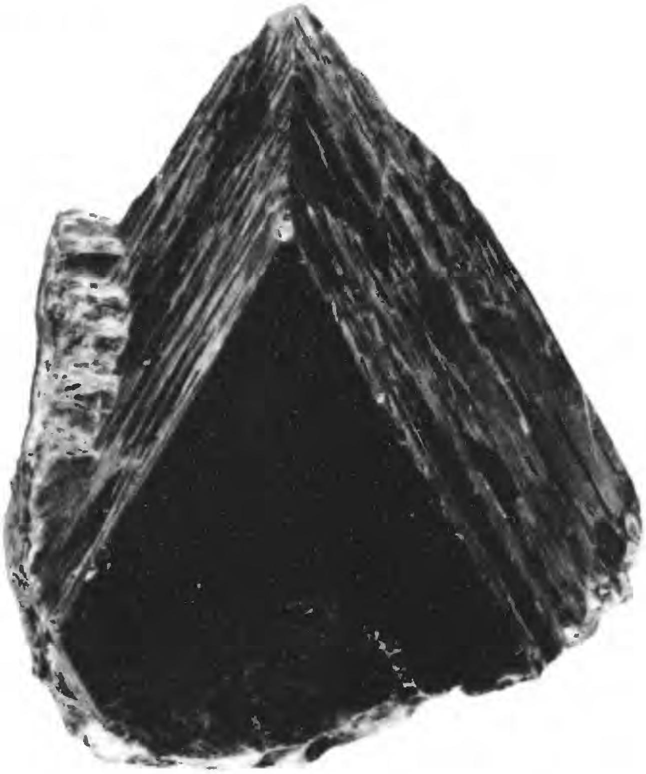


FIGURE 7.—Types of fragments formed by breaking along parting or ruling planes in a muscovite crystal. Orientation is shown with respect to percussion-figure directions and crystal faces.

EXPLANATION OF PLATE 3

1. Wedge–A book. One-half natural size.
2. Edgewise view of same book. Approximately three-fifths natural size.
3. Curved wedge–A book. One-half natural size.
4. Edgewise view of same book. Approximately three-fifths natural size.
5. Chub–A book. Approximately natural size.
6, 7. Ribbed, or cleavage-stepped, mica. Two-fifths natural size.
8, 9. Buckled, or cupped, mica. Two-fifths natural size.
10. Severely folded mica. One-half natural size.

WEDGE STRUCTURE AND DEFORMATION IN MUSCOVITE


1


2


3


4

RULING IN CLEAVAGE PIECES OF MUSCOVITE

COLOR

Most mica is distinctly colored, especially in sheets one-sixteenth of an inch or more thick. Thick sheets and plates of commercial muscovite have been variously described as "red," "ruby," "rum," "red rum," "green," "amber," "yellow," "gray," "white," "water-colored," and "black," with or without modifying terms indicating tints, shades, or intermediate hues. Much confusion has arisen from duplication and inconsistencies in the usage of these terms. "Amber" mica, for example, is the common trade name for phlogopite; therefore the term "amber" is not wholly desirable for muscovite. Deep-brownish to greenish-olive mica is termed "water-colored" in North Carolina, whereas the same designation is applied to very light green mica in northern New Mexico. "White" and "gray" are used either to describe mica that is very pale in color or to distinguish any thinly split muscovite from the amber phlogopite. Some micas with many air bubbles or clouds of minute light-colored inclusions also are referred to as "gray." "Black" is applied to muscovite with abundant inclusions of magnetite or hematite and also to sheets of dark-brown, greenish-brown, or black biotite ("black-jack"). "Red" mica either contains numerous inclusions of brightly colored goethite and turgite or is interlayered with iron-stained clay.

In general the color of commercial muscovite, as viewed by light transmitted through cleavage pieces, ranges from drab and pinkish buff through reddish brown and shades of brown and green to pale yellowish green and yellow. The color of muscovite is chemico-compositional,[8] as it depends upon composition for pieces of a given thickness. Studies in the biotite group have indicated that iron causes a green color, titanium produces brown and red, and magnesium dilutes or masks the effects of titanium,[9] but no such studies appear to have been made in the muscovite group. Systematic and detailed tests for color-composition relations in several muscovites from the Southeastern States are being made at the present time, and those thus far completed indicate that variations in iron content are accompanied by appreciable variations in color.

Muscovite is distinctly pleochroic, with the greatest color differences in the so-called ruby and rum varieties. The colors of smooth-faced crystals, viewed parallel to their cleavage, generally are pale tints of yellow, yellowish green, green, or yellowish brown, whereas the colors as seen perpendicular to the cleavage direction are darker and commonly are more brownish or reddish. Muscovite is much more transparent to light rays parallel to the cleavage than to those normal to it; thus some books of cinnamon-brown mica 3 inches in diameter and a quarter of an inch thick are fully as transparent when viewed edgewise as when viewed from top or bottom.

Few mica books are colored uniformly throughout. Some are crystallographically zoned and yield cleavage plates with well-defined color bands that are called "mine markings" in several Southeastern districts. The bands are parallel to crystal outlines and hence are generally hexagonal or rhombic in plan (pl. 7). Alternating narrow bands of slightly but distinctly differing shades of brown or green characterize the books of some deposits. They are most abundant near the rims of most zoned books but are concentrated near the centers or are scattered throughout others. Broader color bands are known from many deposits but in general are not so common. Color differences between adjoining bands generally are greater in broadly zoned books than in those with more abundant but narrower bands. Crystallographic zoning in many books appears only as narrow rims or as small centers or cores. Some pinkish-buff and cinnamon-brown micas are marked by distinctive color patterns of a grating or gridiron type (pl. 7). The distribution of pattern areas in otherwise uniformly colored sheets is related to the crystal directions of the mica.

The margins of nearly all books are distinctly lighter in color than their inner parts. This appears to be a bleaching effect and is recognizably later than true crystallographic color zoning. Similar bleached areas flank cracks and surround holes and many inclusions. The boundaries between the bleached and the unaffected parts of the books are gradational and irregular. Some mica is mottled, with very irregular splotches of one color in a background of a slightly different color. Most of this mica is clear, transparent, and otherwise of sound appearance.

Color has affected the merchantability of muscovite since the days when its chief uses were based largely upon transparency. The light-brown and light-green micas, which yield more transparent

[8] Kennard, T. G., and Howell, D. H., Types of coloring in minerals: Am. Mineralogist, vol. 26, p. 418, 1941.

[9] Hall, A. J., The relation between colour and chemical composition in the biotites: Am. Mineralogist, vol. 26, p. 29, 1941.

EXPLANATION OF PLATE 4

1. Part of thick book, bounded by two well-developed ruling planes. Approximately natural size.
2. Deeply ruled pieces from large, flat book, with typical strip mica, or ribbon mica, at bottom. One-third natural size.
3. Deeply ruled and cracked pieces from slightly warped book. Ruling interrupted by inclusion of quartz elongated parallel to the ruling plane in piece at top. Hair mica, developed by very closely spaced ruling along edge of broken fragment, appears in two pieces at bottom. One-half natural size.
4. Large piece of flat-A mica, showing relation of ruling to reeve directions. Approximately one-half natural size.

sheets of a given thickness, commanded a higher price than the darker-colored micas. This was carried over into periods of increasing electrical uses, the dark-brown and brownish-green micas being "classed as 'No. 2,' even when flawless and clear." [10] Later, when the scrap-mica industry first expanded into prominence, it was found that the lighter-colored micas yield a whiter ground product; hence such varieties of scrap were sold for higher prices.

In selecting sheet mica for electrical uses during recent years, purchasers have placed varying degrees of emphasis upon the desirability of the so-called ruby micas as contrasted with the green and especially the dark-green varieties. It has been stated repeatedly that dark or green muscovites "usually are poorer dielectrics," but the basis for such statements is not entirely clear. At best, they appear to be generalizations extrapolated from scattered and unsystematic data. That they are open to serious question has been plainly indicated by several series of tests made during recent years, and their acceptance therefore might well be deferred until the effects of color have been more fully investigated.

STAINING, INTERGROWTHS, AND INCLUSIONS

The presence of visible mineral or vegetable impurities in book mica generally reduces its value. Some impurities occur as crystals or crystal groups that extend through considerable thicknesses of the mica; they must be removed and the immediately surrounding mica trimmed away before the remainder of the book can be split into sheets. Others are finely divided or thinly flattened between the mica laminae, and the part of the book in which they occur generally is trimmed away and either discarded as scrap or prepared as sheet stock of inferior grade. The proportion, distribution, and type of inclusions, intergrowths, and stain lead to such designations as "mottled," "specked," "spotted," "freckled," "lined," "black," "black-stained," "black-spotted," "lightly stained," "heavily stained," "dotted," "powder-specked," "blotched," and "curdy."

Two general types of impurities occur in commercial muscovite. These are most simply designated as primary and secondary and can be subdivided as follows:

Primary impurities:
- Air stain.
- Mottling and "vegetable stain" (inorganic).
- Mineral intergrowths and inclusions.

Secondary impurities:
- Air creep.
- Clay stain.
- Iron stain.
- Manganese stain.
- Vegetable stain (organic).

The primary stains were formed during or soon after crystallization of the mica and hence are distributed without regard to the position of the deposit with respect to the present land surface. These blemishes are as likely to increase with depth as to decrease. Secondary stains, in contrast, occur only at or near the surface and characteristically are absent from those parts of the deposit beneath the oxidized zone.

PRIMARY IMPURITIES

"Air-stained" mica contains flattened pockets, tiny bubbles, or groups of closely spaced gas bubbles (pl. 5, no. 1). Clusters of very small bubbles are known as "silver spots" in the Southeastern States. Other types of air stain include grayish to silvery spots, specks, and lines, many of which are so closely spaced that they destroy all transparency of the mica. Where they are confined to certain sheets they can be removed by careful splitting, but they are scattered through all parts of many books. In general the effects of air inclusions on the splitting and electrical qualities of muscovite are not so serious as the effects of most mineral stains, and moderately to heavily air-stained mica is unsatisfactory only for certain types of specialized electrical equipment.

Some mica is marked by a pale-green, yellowish, or greenish-brown discoloration that is termed "vegetable stain." Where essentially primary, such stain consists of minute scales or finely divided aggregates of chlorite, biotite, or material rich in ferrous iron. Individual crystals and mineral masses cannot be recognized megascopically or even with low magnifications under the microscope. Most vegetable stain is evenly distributed as extremely thin, curdy aggregates. Similar material that occurs as separate clumps is generally referred to as "mottling." Specks, spots, and lines of such stain also are known (pl. 5). Vegetable stain and mottling rarely are so dense that they seriously affect the transparency of mica that otherwise is of good quality. Like air stain, they generally are significant defects in terms of the most exacting end uses only.

Deep grassy-green specks, spots, and lines are sparsely scattered through much book mica. These are like typical vegetable stain in general curdy appearance, but individual masses are darker and more clearly defined and appear to be somewhat denser than the scales and aggregates that compose most vegetable stain. Some mica contains scattered green, brown, or reddish-brown spots and "bursts" of curdy stain. Where they are a quarter of an inch or more in diameter, the brown spots are commonly termed "cigarette burns." In some districts the occurrence

[10] Sterrett, D. B., Mica deposits of the United States: U. S. Geol. Survey Bull. 740, p. 17, 1923.

of brown and green spots with fuzzy edges and dark, well-defined centers leads to the designation "frog-eye" mica. Some spots and bursts are haloes of discoloration that surround tiny inclusions of zircon and allanite, but others contain no recognizable cores of foreign material.

Mineral stain, which comprises intergrowths and inclusions of recognizable crystals, is the most serious of the primary impurities. Among the minerals that occur within books of muscovite are actinolite, albite, allanite, apatite, beryl, biotite, brookite, chlorite, columbite, dumortierite, epidote, fluorite, garnet, hematite, kyanite, magnetite, manganese oxides, marcasite, microcline, pyrite, pyrrhotite, quartz, rutile, sillimanite, sphene, staurolite, thulite, topaz, tourmaline, vermiculite, zircon, and zoisite. The distribution and shape of many of these minerals are influenced or controlled by crystal directions in the host mica. This is especially clear in the case of magnetite, hematite, and some manganese oxides but can be demonstrated for other minerals by means of statistical studies only.[11] Probably few of the included minerals are unoriented in the strictest sense.

Magnetite and hematite are the most common inclusion minerals. Magnetite occurs as laths, needles, skeletal forms, and flattened crystals that are six-sided in plan (pl. 5). In general, these last are of an octahedral-dodecahedral combination form [12] and are characterized by prominent octahedral parting cracks. Some of the inclusions, gray to bluish gray or violet, are so thin that they are transparent. Crystal outlines and parting directions are oriented in accordance with the pressure and percussion figures. The six-sided crystals are about 9 millimeters in maximum diameter, with an average of less than 1 millimeter. The markedly elongated crystals are at least 4 millimeters in average length, with maximum recorded lengths of 10 centimeters.[13] Most magnetite inclusions are less than 0.01 millimeter thick, but some are 0.1 millimeter and a few nearly 1 millimeter thick.

The inclusions in much of the so-called specked and lightly specked muscovite are magnetite, characteristically scattered through the books. In some books, however, they are confined to certain sheets or groups of sheets, and in others they occur in well-defined belts parallel to "A" reeves or in concentric zones parallel to crystal faces of the host mica. The zonal arrangements appear to reflect the stages of mica growth, and some very narrow individual zones of tiny inclusions lead to recognition of phantom mica crystals that probably are analogous to the well-known phantom quartz crystals. The thinnest inclusions of magnetite do not affect the general splitting quality of the muscovite, and sheets and films that enclose such plates, laths, and needles are easily split. The thicker inclusions, in contrast, tie the mica on a small scale and thus seriously impair its filming properties. Such mica is sometimes referred to as "spot-welded," "spot-locked," or "black-pitted."

Hematite, the most abundant and widespread inclusion mineral in commercial muscovite, occurs as flattened skeletal crystals with a hexagonal outline, laths and flattened needles, simple and complex dendritic forms, and latticelike forms that are extreme developments of skeletal crystals (pl. 6). The lattices are characteristically triangular, with the three elements parallel to rays of the percussion figure or, much less commonly, to the rays of the pressure figure in the enclosing mica. Other elements lie perpendicular to the three principal directions of some lattices, and the symmetry of the whole is hexagonal. The hematite inclusions are black, dark brown, reddish, smoky brown, and buff (pl. 7), and none show the bluish shades of most very thin magnetite inclusions. In general they are more transparent than the magnetite crystals.

The dendritic and latticelike growths have been identified as magnetite by many investigators [14] and as hematite by others.[15] It can be demonstrated that those in micas from the southeastern and southwestern United States are hematite, and those in micas from other localities probably are hematite as well. Frondel and Ashby [16] have summarized the principal differences between magnetite and hematite inclusions in muscovite, chiefly on the basis of detailed studies of collections from the northeastern United States.

Some hematite laths and plates are bounded by smooth and regular crystal faces, but the edges of most are so irregular that they create a feathered or dendritic appearance. All are extremely thin, especially as compared with their areal extent, and they are not separable from the enclosing mica by ordinary mechanical means. Their maximum thickness is considerably less than 0.01 millimeter, whereas most occupy areas of several square centimeters. Individual lattices and skeletal crystals more than 3 feet long occur in some large books. Where the hematite

[11] Frondel, Clifford, Oriented inclusions of tourmaline in muscovite: Am. Mineralogist, vol. 21, pp. 777–799, 1936; Oriented inclusions of staurolite, zircon, and garnet in muscovite; skating crystals and their significance: Am. Mineralogist, vol. 25, pp. 69–87, 1940.

[12] Frondel, Clifford, Oriented inclusions of tourmaline in muscovite: Am. Mineralogist, vol. 21, p. 107, 1936.

[13] Idem.

[14] Dana, J. D., and Brush, G. J., On the magnetite in the mica of Pennsbury, Pa.: Am. Jour. Sci., 2d ser., vol. 48, pp. 360–362, 1869; Sterrett, D. B., Mica deposits of the United States: U. S. Geol. Survey Bull. 740, pp. 17–18, 1923.

[15] Rose, G., Asterism: Preuss. Akad. Wiss. Monatsber., pp. 614 et seq., 1862; Frondel, Clifford, and Ashby, G. E., Oriented inclusions of magnetite and hematite in muscovite: Am. Mineralogist, vol. 22, pp. 104–121, 1937.

[16] Frondel, Clifford, and Ashby, G. E., op. cit.

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stain is dense, it consists of many superposed crystals that are separated by thin films of mica, and where it is less dense, correspondingly fewer crystals or lattices are present. The stained parts of some books can be split out, leaving clear sheets of high quality. The stain is confined to the centers or to one or more sides of other books, in which the hematite-bearing mica can be trimmed away from the clear material.

The outer parts of hematite-stained books are characteristically free from inclusions, even where the remainder of the mica is very heavily stained. Clear mica commonly flanks cracks and parting planes and surrounds holes in books that elsewhere contain hematite inclusions. The distribution of such stains also is influenced by some warping, rippling, and other secondary structures in the mica. Zonal concentrations of hematite comparable to those of magnetite have not been observed, and in general the hematite appears to have developed after crystallization of the muscovite. On the other hand, its distribution within individual unaltered mica books and its occurrence in deposits at considerable depths beneath the oxidized zone preclude its explanation as an ordinary alteration product of the mica or as material introduced from sources outside the mica books. It appears rather to have crystallized from solid solution in the muscovite, as suggested by Frondel and Ashby,[17] and as such is here considered "primary" in the same sense as analogous exsolution growths in metallic ore minerals. Iron oxide films and spots, presumably of exsolution origin, can be developed experimentally by heating some varieties of clear muscovite to temperatures of 550° C. or more, but typical hematite dendrites and triangular lattices are not so simply reproduced.

Inclusions of hematite appear to have little effect upon the splitting qualities of muscovite, at least as far as its commercial preparation is concerned. Ordinarily the stained parts of books with hematite lattices or spots split as easily and uniformly as the unstained parts, and there is no perceptible tying of sheets. Both hematite and magnetite, however, seriously increase the conductance of the mica in which they occur and hence lower its value. The amount of lowering depends upon the thickness, abundance, and distribution of the inclusions.

Goethite occurs in sheet mica as yellow, orange, red, reddish-brown, or brown scales, stains, and pseudomorphs of other iron oxide minerals (pl. 7). Most appear to have been formed by alteration of hematite and magnetite inclusions, but some of the most finely divided scales may well have been developed directly by precipitation from solid solution in the mica.

Quartz and albite are interlayered with some muscovite plates to form composite masses of little or no economic value. The edges of other books are intergrown with these minerals. Books in which quartz, apatite, or tourmaline spindles are present are known as "gritty," "sandy," "stony," or "sand-pitted." Where the axes of such spindles are oblique or perpendicular to the cleavage, the impurities effectively tie the books. Actinolite, allanite, beryl, kyanite, rutile, tourmaline, zoisite, and other species of elongate habit commonly occur as individual crystals, bundles, and parallel groups of crystals, sprays, and rosettes (pl. 8). Although they lie parallel to the cleavage surfaces, they generally penetrate enough laminae of the mica to affect its splitting properties seriously. Many of the crystals are oriented parallel to rays of the pressure or percussion figures. Others appear to be distributed at random, although preferred orientations for several minerals have been demonstrated by statistical studies.[18]

Fluorite, garnet, pyrite, and other minerals occur as inclusions that are much flattened parallel to the plane of cleavage in the mica. They are characteristically equant in that plane. The flattening is extreme in many books, but in others the inclusions are much thicker and they tie considerable numbers of mica laminae. The average diameter of garnet inclusions probably is less than 5 millimeters, although flattened tablets an inch or more in diameter are known. Most are less than 0.3 millimeter in thickness, and many are as thin as 0.05 millimeter. These dimensions also apply to other inclusion minerals of similar habit. The prismatic and other elongated inclusions are of comparable thickness but commonly reach lengths of several inches.

Biotite is intergrown with muscovite in many deposits. Inclusions of biotite in muscovite are common (pl. 8), but inclusions of muscovite in biotite are sparse or rare. In some districts the muscovite is in-

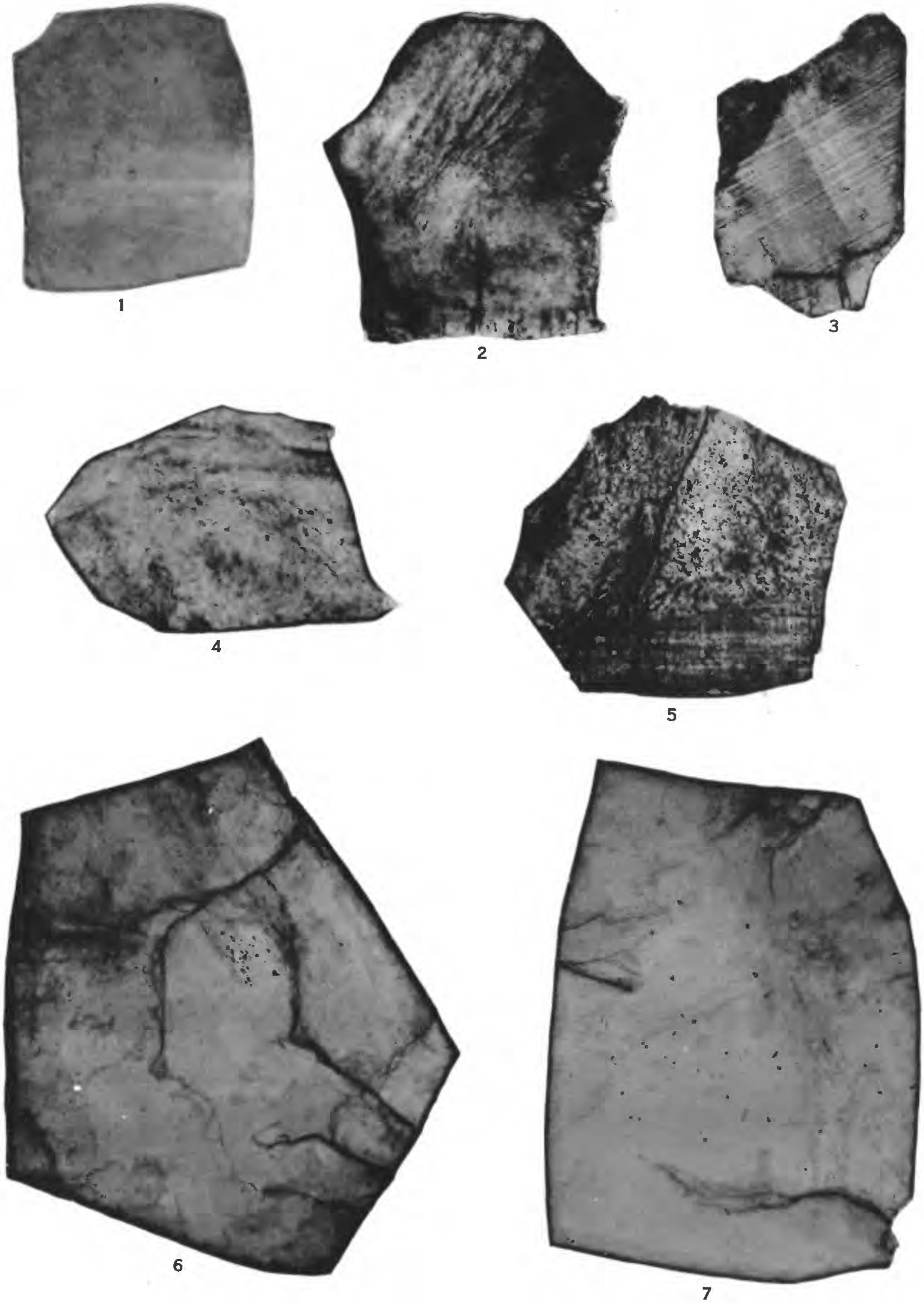
[17] Frondel, Clifford, and Ashby, G. E., op. cit.

[18] Frondel, Clifford, Oriented inclusions of tourmaline in muscovite: Am. Mineralogist, vol. 21, pp. 777–799, 1936; Oriented inclusions of staurolite, zircon, and garnet in muscovite; skating crystals and their significance: Am. Mineralogist, vol. 25, pp. 69–87, 1940.

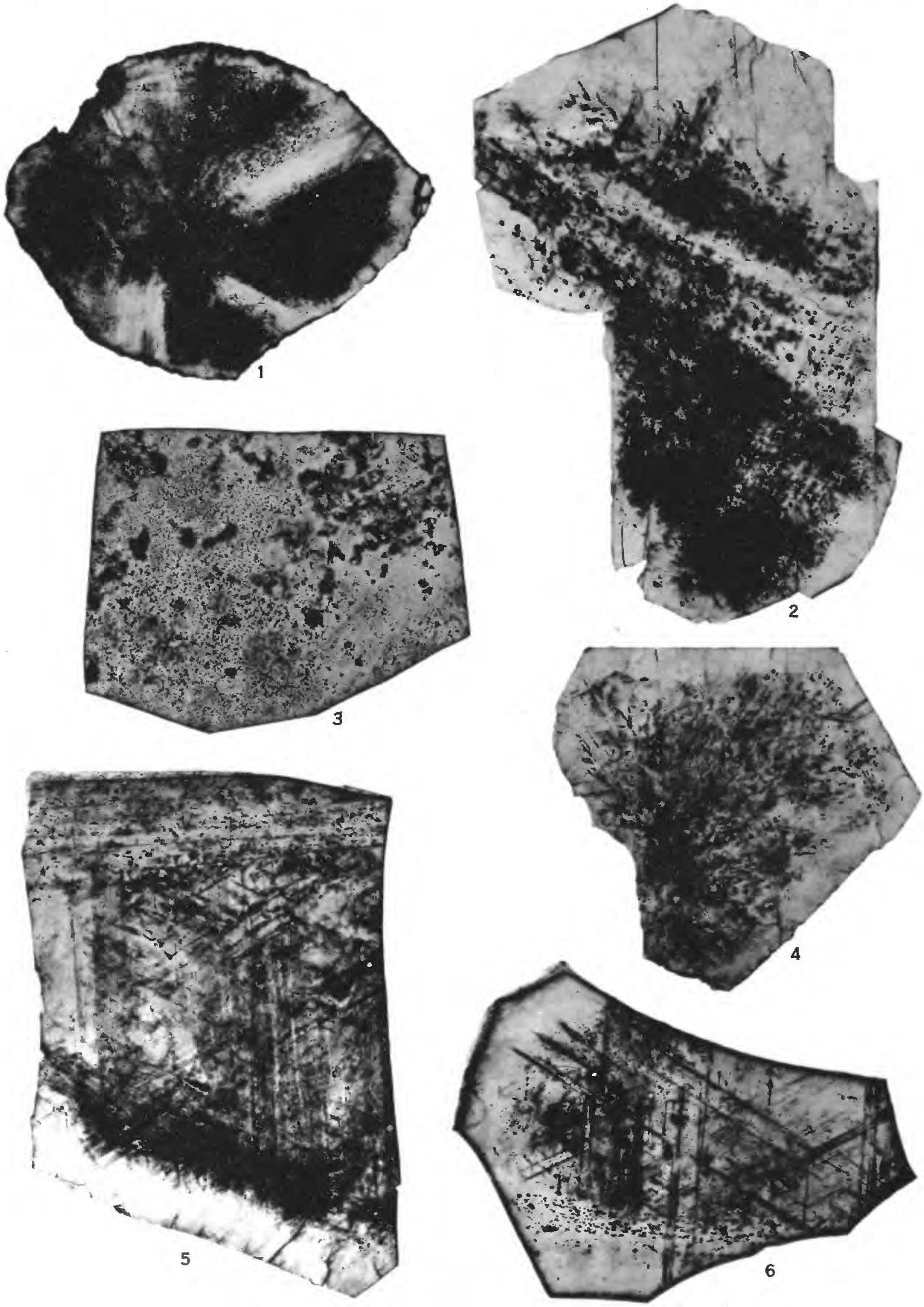
EXPLANATION OF PLATE 5

[Figures approximately three-quarters natural size]

1. Air stain.
2. Dense green mottling and vegetable stain.
3. Grassy-green stain in form of rectangular lattice.
4. Curdy green stain with little systematic arrangement.
5. Dense lattice of green stain and abundant vegetable stain, with black spots of hematite.
6. Flattened crystals of magnetite elongated parallel to pressure-figure directions. Note thin, fine color strips and air creep, which appears as dark-gray areas in the mica sheet.
7. Scattered specks and small spots of hematite. Widespread air creep.



PRIMARY STAIN IN MUSCOVITE



PRIMARY HEMATITE STAIN IN MUSCOVITE

tergrown with vermiculite, which presumably was derived from biotite by alteration. Where biotite and muscovite are intergrown, the cleavages of the two minerals generally are parallel, but the pressure and percussion figures of the inclusions are commonly oriented perpendicular to those of the host (fig. 8). A few inclusions of biotite are elongated normal to their cleavage direction and lie oblique to the enclosing muscovite, thus tying the sheets of the host book. Most of the inclusions are bounded by well-formed prism and pinacoid faces, and the contacts between the two micas are tight. Other biotite crystals, however, are markedly pyramidal in habit, and their contacts with the muscovite intersect the mutual cleavage surface at low to moderate angles. Such inclusions are less firmly joined to the host mineral and tend to pop out when the mica book is split.

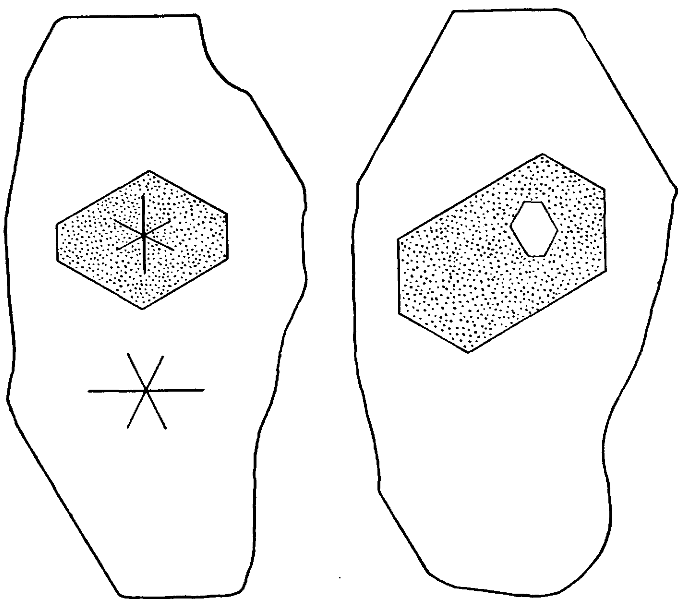


FIGURE 8.—Biotite-muscovite intergrowths. *A*, Biotite in muscovite, with orientation shown by percussion figures; *B*, Muscovite in an inclusion of biotite.

A few inclusions of biotite in muscovite themselves contain inclusions of muscovite (fig. 8), and the relations of some of these "multiple crystals" are somewhat similar to those of crystal zoning. The biotite inclusions in some books are merely rinds around smaller muscovite crystals, and in others they surround muscovite that forms the core of the book. Other composite books are composed of muscovite with muscovite inclusions or of muscovite cores with successive rims of muscovite. These are difficult to recognize but probably are not common.

SECONDARY IMPURITIES

"Air creep," a secondary stain, is similar in appearance to some types of air stain. It is merely air that enters the mica sheets through their edges and penetrates them along cleavage planes (pl. 5). In general it is caused by rough handling during preparation of the mica, especially by trimming with shears or a dull knife. This type of stain is easily distinguished from primary air stain, which consists of many small bubbles or larger air pockets that are fully and firmly enclosed. The creep pockets, in contrast, are either connected with the trimmed or natural edge of the sheet or can be so connected by pressing the mica between the thumb and forefinger. They do not constitute a significant defect unless they occupy so many cleavage openings that the transparency of the mica is materially reduced.

Most books that have been exposed to weathering and the action of downward-percolating surface waters are coated with calcite, chalcedony, clay minerals, hydrous iron oxides, manganese oxides, or other secondary minerals. Where these have been deposited by waters that penetrated between the laminae of the mica, they must be removed by careful splitting and trimming (pl. 8). The value of the books is thus materially reduced. Books marred chiefly by silica, calcite, and clay minerals are termed "clay-stained," whereas those that are strongly colored yellowish, reddish, or brownish by iron oxides are referred to as "iron-stained." The term "manganese-stained" has a similar basis.

The organic type of vegetable stain, a truly secondary feature characteristic of the weathered zone in mica deposits, consists of plant material that coats the outer surfaces and some of the cleavage laminae of mica books. Some of the material is carried into the mica by waters that penetrate fractures and cleavage cracks, and some forces its way into the books through the action of growing plants. The near-surface mica of many deposits is veined by the roots of grasses, bushes, and even trees. Most organic vegetable stain is accompanied by heavy clay and iron staining, and books so affected yield little usable sheet material. On the other hand, appreciable quantities

EXPLANATION OF PLATE 6

[Figures approximately three-fifths natural size]

1. Dense aggregates of spots and triangular lattices confined to sectors of a book.
2. Coarse spots and thin-bladed, latticelike crystals.
3. Blotches, small spots, and pale-green vegetable stain.
4. Lathlike intergrowths, showing relation to crystal faces. Note absence of stain near edges of book.
5. Thin triangular lattices, with simpler rows of spots at top.
6. Coarse blades in lattice arrangement, with rows of dendrite spots.

of clear sheets can be obtained from many near-surface books that are marred by only one of these stains.

ELECTRICAL PROPERTIES

The extremely low electrical conductivity of muscovite is a very important property as far as most of its commercial uses are concerned. Unstained mica is the least conductive and is therefore suited for electrical equipment of the best quality. Many mineral inclusions, particularly magnetite and hematite, increase the conductivity; hence stained mica generally is used in articles that do not require the most effective insulation. Conducting impurities in sheet muscovite can be detected by means of a high-voltage spark, which causes glowing or small-scale arcing as it passes through the mica at or near the inclusions.

The dielectric constant (K), or specific inductive capacity, of muscovite is the ratio of the capacitance of a condenser in which the muscovite is the nonconducting substance to the capacitance of a condenser in which air (or, more exactly, a vacuum) is the dielectric. Values for this property generally are given in terms of specific conditions of applied voltage, frequency of applied current, and temperature, moisture content, and other features of the mica in question. K for sheet mica ranges from 2.0 to about 8.5 but generally is more than 6.5, with an average of about 7.2. It is a property of great significance for many electrical uses but is so uniformly satisfactory in micas that are otherwise of good quality that limiting values are rarely specified by purchasers.

The dielectric strength of muscovite is its ability to resist break-down or rupture under conditions of high voltage or electric field strength. It is defined in terms of the maximum potential gradient that material of a given thickness can withstand and generally is expressed in kilovolts per centimeter or volts per mil of thickness. It is tested by means of the high-voltage spark (concurrently with testing for conducting impurities in the mica) or—more commonly—by applying high voltages through spherical or platelike contact electrodes. Dielectric weakness is caused by pinholes, cracks, tears, and other inhomogeneities or discontinuities in the mica sheets. Many of these are recognizable in ordinary visual examination, but others are so small or inconspicuous that they are easily overlooked. High dielectric strength and heat resistance are particularly desirable in mica used for electrical generating equipment.

A very significant electrical property of mica used in condensers is its power factor (PF), which is a measure (expressed in percent) of the loss of electrical energy in a condenser in which the mica is the dielectric. Such loss is due chiefly to dielectric absorption, which produces a component of the applied voltage in phase with the current as though an additional resistance were placed in series with the condenser. Excessive overheating and damage result from high power losses; hence good condenser mica must have a power factor of less than 0.04 percent at a frequency of 1 megacycle. The Q value, a factor more commonly used in recent years, is the reciprocal of the power factor, so that $Q = 1/PF$. The Q value of good condenser mica therefore should be at least 2,500.

USES

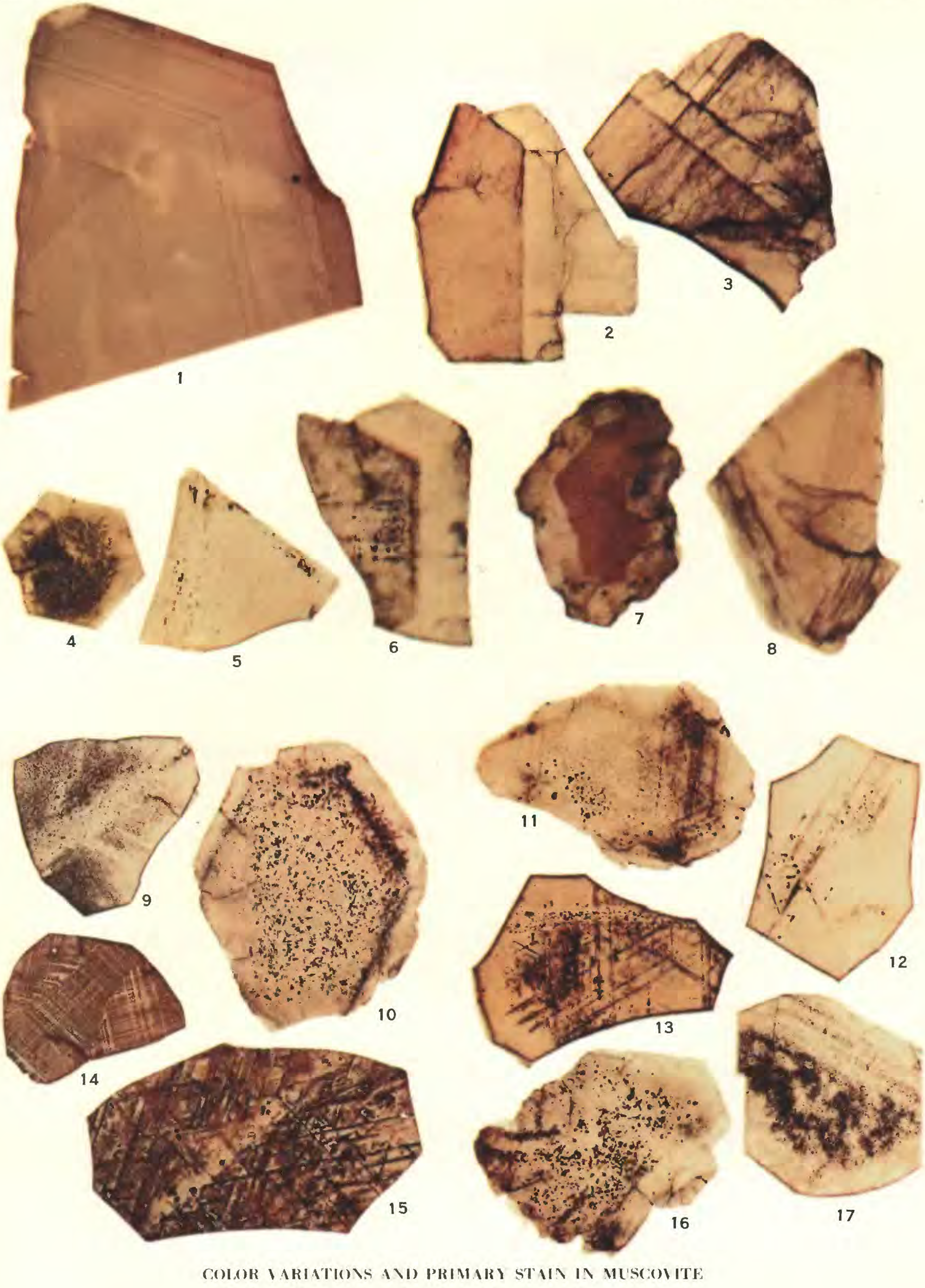
The uses of mica are based upon its perfect cleavage, exceptionally low conductivity of heat and electricity, high dielectric constant and dielectric strength, low dielectric loss, heat resistance, noninflammability, mechanical strength, flexibility, elasticity, transparency, luster, and lubricating properties and the ease with which it can be worked into final form. The degree of emphasis placed upon given properties by the purchaser depends upon the specific end use involved.[19] Flexibility is particularly important, for example, in the "cigarette" mica used in spark plugs for aircraft engines. This material, in films 0.0012 inch or less thick, is wrapped around rodlike spindles a little more than an eighth of an inch in diameter. In condenser mica dielectric properties are most desirable, and—in contrast—the use of mica for windows in furnace walls and doors is founded upon its transparency, heat resistance, and mechanical strength.

A very high proportion of all sheet mica is used as electrical insulating material. Washers, disks, and

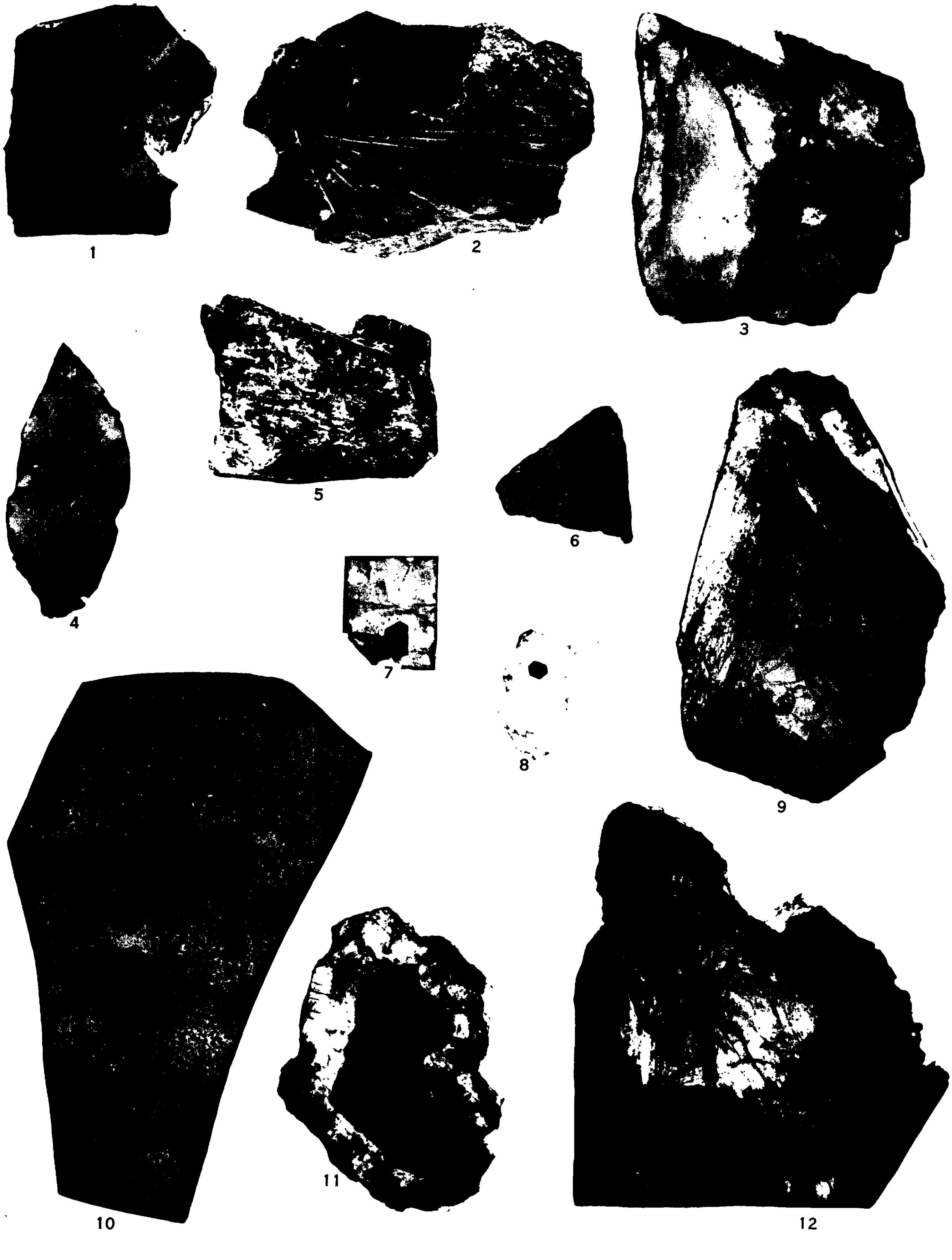
[19] Wierum, H. F., and others, The mica industry: U. S. Tariff Comm. Rept. 130, 2d ser., pp. 11–26, 1938; Spence, H. S., Mica: Canada Dept. Mines, Mines Branch, Pub. 701, pp. 102–120, 1929.

EXPLANATION OF PLATE 7

1. Crystallographic color zoning. One-third natural size.
2, 3. Major color change, with green-brown boundary parallel to crystal faces. One-half natural size.
4. Rude crystallographic control of hematite stain. One-half natural size.
5. Alined spots and specks of iron oxides, with faint vegetable stain. One-half natural size.
6. Relations of iron oxides and other stains to crystal directions in a color-zoned sheet. One-half natural size.
7. Color zoning apparently caused by marginal bleaching. One-half natural size.
8. Greenish stripes and gridiron color patterns. One-half natural size.
9, 10. Hematite specks, spots, and blotches in yellowish-olive to yellowish-green mica, with local vegetable stain. Two-fifths natural size.
11, 12, 13. Lattices and spots of hematite in yellowish-olive to brownish-olive mica. Two-fifths natural size.
14. Rectangular lattices of curdy brown stain in yellowish-olive mica. Two-fifths natural size.
15. Hematite spots, blotches, and trigonal lattices in yellowish-olive mica. Two-fifths natural size.
16, 17. Hematite specks and spots, with pale vegetable stain, in yellowish-olive mica. Two-fifths natural size.



COLOR VARIATIONS AND PRIMARY STAIN IN MUSCOVITE



MINERAL INCLUSIONS AND CLAY STAIN IN MUSCOVITE

other small trimmed or stamped forms are not only employed as such, but can be built up into rods, tubes, or other articles that are bonded with a suitable cementing material. Simple and composite pieces are used, for example, as tubes, sleeves, studs, washers, bushings, laminations, and thin perforated plates in condensers, transformers, small heating elements, rheostats, fuses, incandescent bulbs, radio and electronic tubes, various types of coils, and acoustic, X-ray, and other specialized equipment. Thin splittings are built up into mica board or are applied as facing on paper, cloth, and other materials used in the manufacture of heater elements; commutators; boards, panels, and other mounting forms; parts of condensers; and many other electrical devices. In addition, coarsely and finely ground micas have a wide variety of uses.

The unusual conditions of wartime periods create heavy demands for so-called "strategic" mica, which is used as splittings in the form of built-up mica commutator segments and coil insulation in motors and generators and in transformers, switchboards, blasting apparatus, and aircraft generators and spark plugs.[20] Some of the greatest demands and most exacting requirements during World War II were outgrowths of developments in the field of military radio and electronic equipment. When it became evident that the need for dielectric materials of high quality would increase without concomitant assurance of adequate supplies of sheet muscovite from India, the electrical industry was strongly encouraged to develop satisfactory substitutes for mica. Plain or treated papers, manufactured to meet precise standards of homogeneity, thickness, porosity, strength, chemical composition, and freedom from conducting particles, proved satisfactory for many condensers, particularly those not designed to operate at the highest voltages. Some ceramic dielectrics also gave excellent results when used in capacitors, even at very high voltages.

Substitution of other materials, though successful for some types of condensers, was by no means satisfactory for general application. Mica remained the only suitable dielectric for many varieties of capacitors, particularly those for military use at radio frequencies. The consumption of condenser-quality mica therefore was sharply increased, and as a result many problems were raised in connection with increasing its supply.[21] To stimulate domestic production of such mica, the Metals Reserve Company, a subsidiary of the Reconstruction Finance Corporation, designated the Colonial Mica Corporation as its agent, with authority to purchase mica of certain types and to assist the operators of mines with equipment leases, development loans, and consulting services on problems of mica mining and preparation.

[20] Wayland, R. G., Mica in war: Am. Inst. Min. Met. Eng. Tech. Pub. 1749, pp. 1–2, 1944.

GRADING AND CLASSIFICATION

VISUAL METHODS

As taken from the mine, the mica crystals or books are designated as "mine-run," "run-of-mine," "book," or "block" mica. The term "block" mica is more commonly used for partially prepared stock that will yield sheet material and hence might well be dropped in favor of "book" mica. Commercial muscovite is broadly classified by visual methods as "sheet," "punch," "circle," "washer," or "scrap," depending upon the type of material obtained from the mine-run books. "Scrap" comprises books, flakes, and fragments that are too small or too marred by inclusions, cracks, holes, or other imperfections to yield acceptable sheet or punch stock, as well as the waste from those books that do yield punchings and trimmed sheets. The material removed from the mine-run mica within or near the mine portal is known as "rough" or "cobbed" scrap, or more commonly as "mine" scrap. Ordinarily it never reaches the shops where the better mica is split and trimmed. "Bench" scrap is the mica obtained as discarded splittings and trimmings in the preparation of sheet and punch goods and in general is of better quality than mine scrap. Bench scrap generally amounts to more than 90 percent of the mica that is not classified as scrap at the mine.

"Sheet" muscovite, in the broadest sense, is any material other than scrap. It is flat, or nearly so, and is sufficiently free from structural defects to be manufactured into products of certain shapes that are used

[21] Billings, M. H., and Montague, S. A., The wartime problem of mica supply: Eng. and Min. Jour., vol. 145, no. 8, pp. 92–95, 1944; Burgess, B. C., Mica mining and preparation cost: Am. Inst. Min. Met. Eng., preprint of paper presented at New York meetings, February 1944, pp. 1–17, 1944; Lintner, E. J., Mica, a war essential mineral: Rock Products, vol. 47, no. 5, pp. 48–50, 92–93; no. 6, pp. 74–76, 114–116, 1944; Wayland, R. G., Mica in war: Am. Inst. Min. Met. Eng. Tech. Pub. 1749, 7 pp., 1944; Spence, H. S., Mica as a critical war mineral: Canadian Min. Jour., vol. 67, pp. 611–617, 710–717, 1946; War Production Board, Mica releases 1 and 2, 1942.

EXPLANATION OF PLATE 8

1, 2, 3. Single crystals and sprays of black tourmaline. Three-fifths natural size.
4. Flattened crystals of pyrite. Three-fifths natural size.
5. Rosettes of zoisite in clay-stained mica. One-half natural size.
6, 7, 8. Euhedral crystals of biotite. Three-fifths natural size.
9. Magnetite specks and two brown "cigarette burns" in clay-stained mica, with thin color stripes parallel to pressure-figure directions. Approximately one-half natural size. Clay stain, as viewed here in transmitted light, appears dark.
10. Flattened garnet crystals in hematite-stained mica. Three-fifths natural size. Note absence of iron oxide spots from immediate vicinity of garnet inclusions.
11, 12. Color zoning partly obscured by clay stains. Approximately one-half natural size.

in electrical equipment, stoves, lamps, and other appliances. "Uncut" sheet mica is partly prepared stock that has been freed of obvious scrap, split or "rifted" into plates three-eighths of an inch or less thick, and trimmed by any of several methods. If it will yield sheets or "patterns" of regular shape that are 1½ by 2 inches in minimum size, it is specifically known as "sheet" or "pattern" mica in the New England and Southeastern States and as "plate" mica in the Southwestern States. Gwinn [22] has pointed out that the general term "block" mica is most suitable for such material and has defined it as prepared stock of "random thickness ⅛ inch to less than 1/100 inch (125 to 10 mils), which contains a usable area of 1½ by 2 inches minimum."

"Punch" mica is difficult to define rigorously, owing chiefly to inconsistencies in the usage of the term. In general, however, it is uncut material capable of yielding punched or trimmed sheets that are free of cracks and other defects, are at least 1½ inches in diameter, and are less than 1½ inches wide and 2 inches long. "Circle" mica will yield prepared sheets 2 inches in diameter, and "small punch," "washer," or "washer-punch" mica will yield 1-inch sheets. Some washer mica is little more than scrap, and many users do not recognize it as a separate class, especially during periods of low prices. "Punch" mica is sometimes used as a general term, including circle, punch (in the strict sense), and some small punch or washer. The terms "uncut punch" and "uncut circle" are synonymous with "punch" and "circle" as generally used but may be helpful in distinguishing such material from the prepared sheets or punchings. "Trimmed punch," or small sheet material, is prepared from ordinary punch stock, generally by knife trimming.

Size grading of sheet mica is based upon the area and minimum width of the largest rectangle of a given quality that can be obtained from the block. In general, the rectangle must meet the quality specifications set by the purchaser. A size-grading chart of the type adopted by the American Society for Testing Materials for domestic block mica and mica splittings is reproduced in figure 9. The method outlined by the Society [23] is as follows:

* * * The specimen to be graded shall be laid upon the chart so that it covers point *O* and has its maximum and minimum dimensions extending along and covering the lines *AO* and *OB*, respectively. The specimen should be shifted until its usable area completely covers the largest rectangle determined by a diagonal extending from point *O* to or beyond a point on any of the curves, Nos. 6, 5½, 5, 4, 3, 2, 1, or A-1 (Special). The number of the curve at greatest distance from *O* cut by the diagonal of the rectangle designates the grade of the specimen.

[22] Gwinn, G. R., Strategic mica: U. S. Bur. Mines Inf. Circ. 7258, p. 18, 1943.

[23] American Society for Testing Materials, Standard methods of testing, grading, and classifying natural mica, A. S. T. M. Designation: D 351-46: 1946 Book of A. S. T. M. Standards, pt. 3-B, p. 144, 1947.

The size groups for domestic and Indian sheet mica are summarized in table 2, and a chart for grading mica according to Indian standard sizes is shown in figure 10. A discussion of size grading and simplified charts for grading are included in a report issued by the United States Bureau of Mines.[24]

Thickness of mica is determined by means of a machinist's micrometer or a rapid-reading dial gage, and specifications for standard methods of determination have been outlined by the American Society for Testing Materials.[25] The minimum acceptable thickness for sheet muscovite is 0.007 inch, but thinner material is sometimes sold under specific agreements. Uniformity of thickness, a function of splitting quality, is judged by viewing the split-out films between crossed polaroid sheets.

TABLE 2.—*Domestic and Indian size groups for sheet mica, including punch and sheets larger than punch*

[Adapted from charts issued by the Colonial Mica Corporation. Applies to sheets not less than 0.007 inch in thickness]

Usual domestic grades	Usable area in single rectangle, in square inches: Minimum	Usable area in single rectangle, in square inches: Maximum	Minimum dimension of one side, in inches	Standard India grades
Small punch [1]	1	1½		6 small.
Punch [1]	1½	2½	¾	6.
Circle [1]	2½	3	1	5½.
1½ by 2 inches	3	4	1	5.
2 by 2 inches	4	6		
2 by 3 inches	6	10	1½	4.
3 by 3 inches	10	12	2	3.
3 by 4 inches	12	15		
3 by 5 inches	15	24	2	2.
4 by 6 inches	24	36	3	1.
	36	48	4	A-1 (Special).
6 by 8 inches	48	60	4	Extra special.
8 by 8 inches	60	80	4	Extra extra special.
8 by 10 inches	80	100	4	Over extra extra special.
Larger than 8 by 10 inches.	100+		4	Over over extra extra special.

[1] Ordinarily included under general designation of "punch," which applies to mica yielding usable sheets less than 1½ inches wide and 2 inches long but not less than 1 square inch in area.

NOTE.—In a new list of tentative specifications, proposed for adoption by the A. S. T. M. in 1949, the limiting dimensions for grade 5½ are altered slightly, grade 6 small is changed to grade 6, and the old grade 6 is eliminated.

Quality designations for sheet mica vary according to the visual classification used, and a combined visual and electrical classification recently adopted by the American Society for Testing Materials yields still another set of terms. Interpretations of visual standards differ from one observer to another, but attempts have been made to define the standards and to describe the methods of determination in such exact terms that inconsistencies are reduced to a minimum. The Indian standard groups, beginning with the best quality, are clear, clear and slightly stained, slightly stained, fair stained, good stained, stained, heavy-stained, light-dotted, black-spotted, and black-stained. In 1938 the

[24] Gwinn, G. R., op. cit., pp. 7-10.

[25] American Society for Testing Materials, Standard methods of test for thickness of solid electrical insulation, A. S. T. M. Designation: D 374-42: 1946 Book of A. S. T. M. Standards, pt. 3-B, pp. 47-51, 1947.

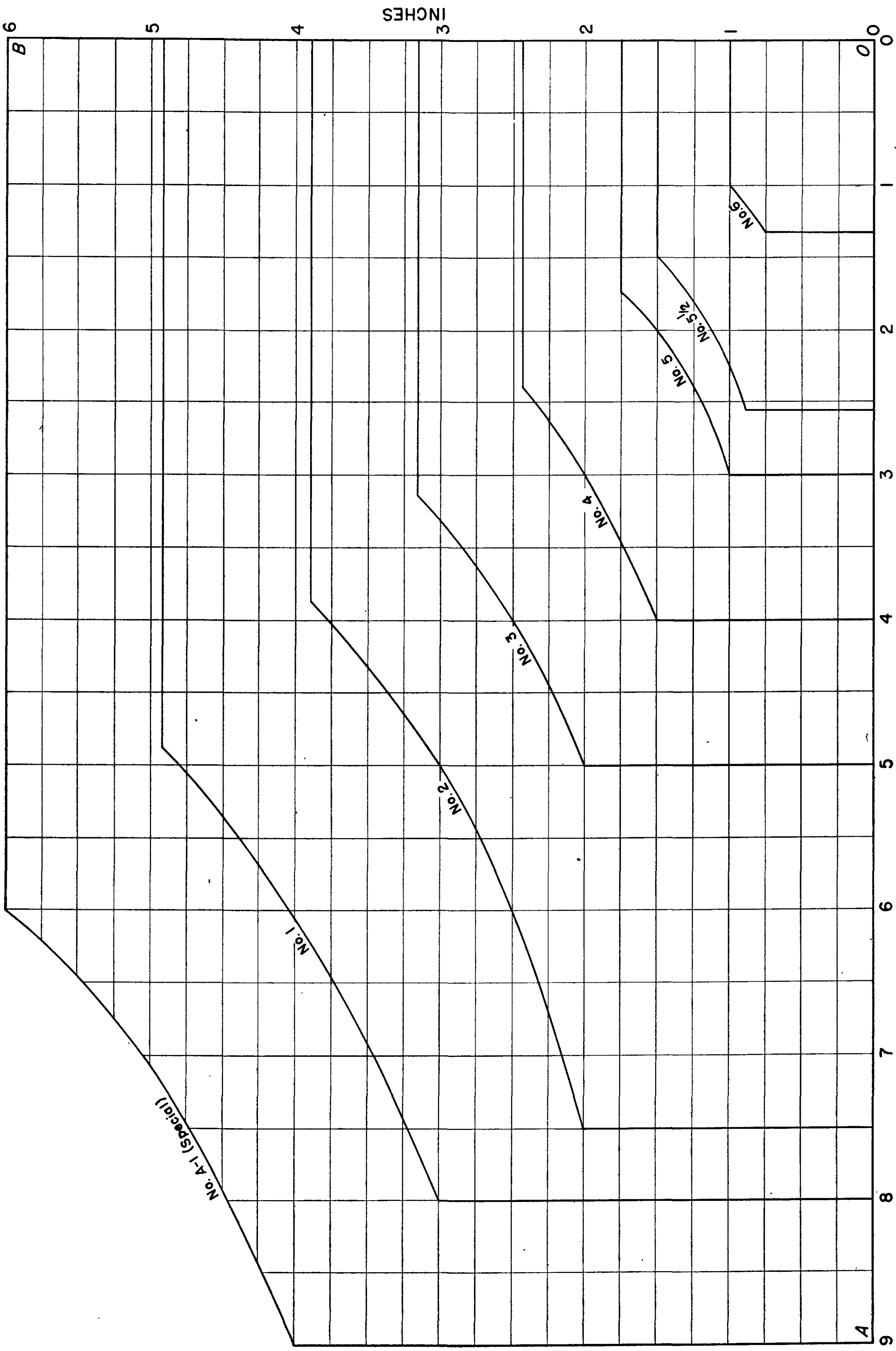


FIGURE 9.—Size-grading chart, patterned after that prepared by the American Society for Testing Materials, for domestic block mica and mica splittings. Courtesy of the A. S. T. M.

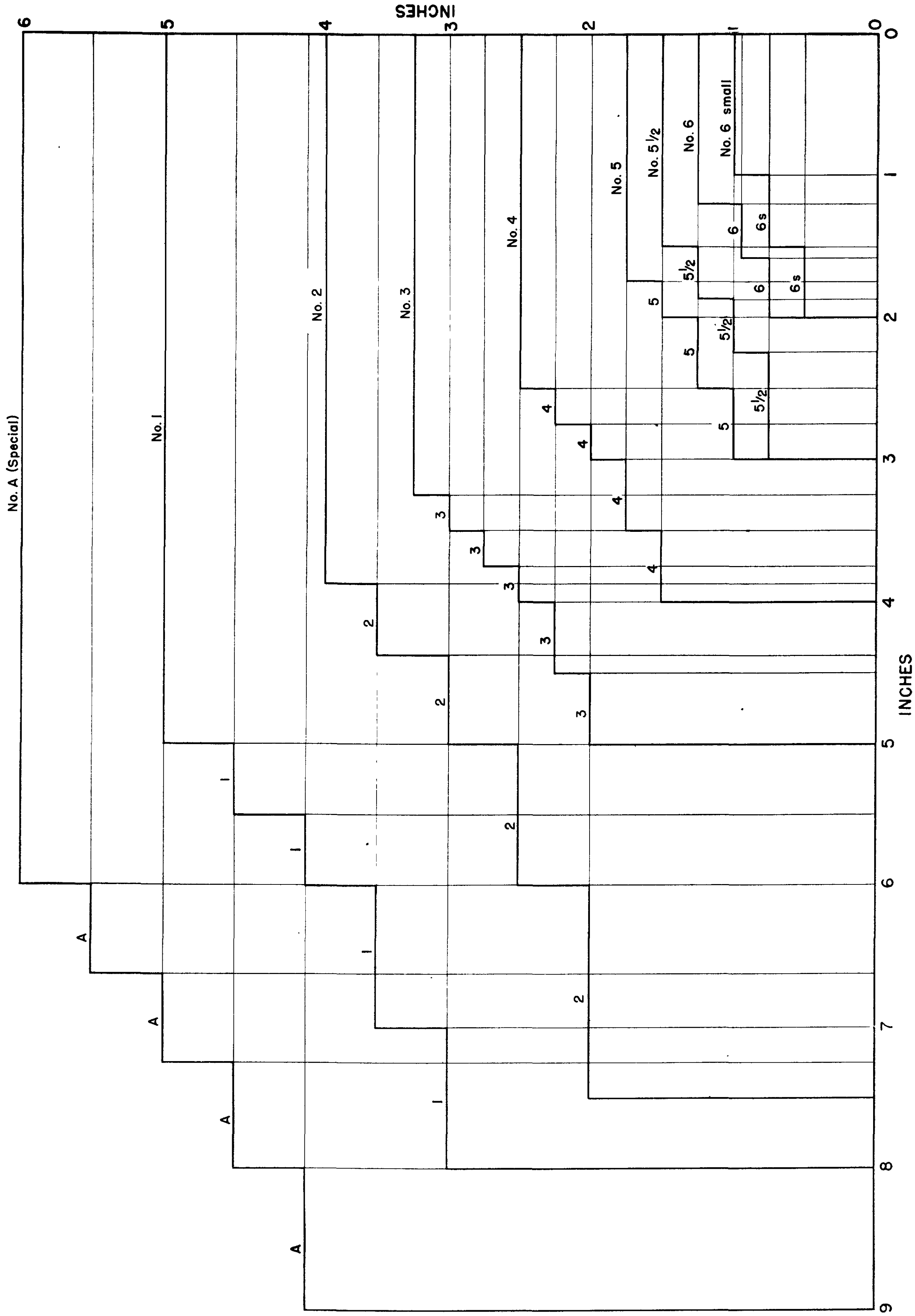


FIGURE 10.—Chart for grading mica according to Indian standard sizes.

American Society for Testing Materials [26] set up Indian grading as the American standard and designated the seven principal qualities here listed. Several of these groups are sometimes subdivided into more specific categories.

Quality classification of sheet muscovite

A. S. T. M. designation	*A. S. T. M. description*	*Supplementary description* [1]
Clear	Free of all mineral and vegetable inclusions, stains, air inclusions, waves, or buckles. Hard, transparent sheets.	Hard and substantially flat. Ten percent of largest rectangle may contain small air spots, and the remainder may contain a few small air specks.
Clear and slightly stained.	Free of all mineral and vegetable inclusions, cracks, waves, and buckles, but may contain slight stains and air inclusions.	Hard, but may be slightly wavy. The largest rectangle may contain small air specks, and one-third of it may contain small air spots. One-tenth of the rectangle may contain small, light air stains, light vegetable stains, or a few mineral specks.
Fair stained	Free of mineral and vegetable inclusions and cracks. Hard. Contains slight air inclusions and is slightly wavy.	Hard, but may be slightly wavy. One-fourth of the largest rectangle must be free of all stains except small air specks, and three-fourths may contain small air spots. One-fourth of the rectangle may contain light air and light vegetable stains or small mineral specks.
Good stained	Free of mineral inclusions and cracks, but contains air inclusions and some vegetable inclusions and may be somewhat wavy.	Hard, but may be wavy though not buckled. The largest rectangle may contain small air specks and small air spots over the entire area. Half of the rectangle may contain light air stains and light vegetable stains, but not more than one-tenth may contain dense air stains or mineral spots and lines.
Stained	Free of mineral inclusions and cracks, but many contain considerable clay and vegetable stains and may be more wavy and softer than the better qualities.	May be soft or hard (approximately 75 percent hard and 25 percent medium soft) and may be slightly buckled. The entire area of the largest rectangle may contain air specks and stains, but not so densely concentrated as to give a silvery appearance to more than one-third of the rectangle. Light vegetable stains or some small mineral specks may be present over the entire area, but not more than one-third of the rectangle may contain dense vegetable stains, lines, or spots.

[26] American Society for Testing Materials, Standard methods of testing, grading, and classifying natural mica, A. S. T. M. Designation: D 351–46: 1946 Book of A. S. T. M. Standards, pt. 3–B, p. 145, 1947.

Quality classification of sheet muscovite—Continued

A. S. T. M. designation	*A. S. T. M. description*	*Supplementary description* [1]
Heavy-stained	Free of mineral inclusions, but contains more clay and vegetable stains than stained quality and is distinctly inferior as regards rigidity and toughness.	May be soft or hard (approximately 50 percent hard and 50 percent soft) and may be wavy and slightly buckled (about 10 percent may be buckled). The largest rectangle may contain dense air stains, and two-thirds of the area may contain dense vegetable stains, spots, or lines.
Black-stained and spotted.	Apt to contain some mineral inclusions consisting of magnetite (black), specularite (red), and hydrous iron oxide (yellow).	

[1] Specific quality-classification data were kindly supplied by Bradley Johnson shop superintendent for the Colonial Mica Corporation, Asheville, N. C. The specifications were applied to sheet muscovite purchased by the Colonial Mica Corporation and in general are slightly less rigorous than those set up by the American Society for Testing Materials. Terms of degree are based on the following descriptions:

Small specks: Size of small pin or needle holes.
Specks: Twice the size of small specks or about the size of the periods made by a typewriter.
Small spots: About three times the size of small specks or about one-sixteenth of an inch in diameter.
Spots: Any spots larger than small spots.
Lines: Series of specks or small specks, forming continuous rows. Individual specks may be in contact or slightly apart.
Light stains: Stains not sufficiently dense to impair the transparency of block mica when ordinary print is read through the sheet.
Dense stains: Stains so dense that they distinctly impair the transparency of the mica, as roughly determined by the reading test.

Degree of flatness is determined by observation of light reflected from the mica sheet as the sheet is rotated back and forth:

Flat: No wave nor ripple of light.
Substantially flat: Only a slight wave or ripple of light.
Slightly wavy: Light appears to rise and fall evenly, without jerkiness, like waves on a pool of water.
Slightly buckled: Light appears to rise and fall jerkily, but the rise and fall from different parts of the sheet do not overlap.
Buckled: Light appears to rise and fall jerkily, with overlap and confusion of motion.

Much mica was purchased in this country according to the so-called domestic classification during World War II. This fourfold classification and its correlation with the A. S. T. M. categories are shown in the following tabulation. Mica sold for use in stove manufacture is generally graded as A–No. 1, No. 1, A–No. 2, and No. 2, in order of decreasing quality. However, a general twofold classification is most commonly used for all domestic sheet mica: Black-stained and spotted material is referred to as "stained" or "electric," and the other types are grouped under the general term "clear." Clear micas, according to this usage, include the No. 1, No. 2, and No. 2 inferior categories listed below:

Domestic quality classification	*A. S. T. M. designation*
No. 1	20 percent clear and slightly stained; 80 percent fair stained.
No. 2	Good stained.
No. 2 inferior	50 percent stained; 50 percent heavy-stained.
No. 3	Black-stained and spotted.

During the recent wartime period, particular attention was given to "strategic" mica, which was defined in War Production Board Conservation Order

M–101 as reasonably flat block and sheet mica of heavy-stained quality or better that is free from cracks and comparable imperfections. Excluded from this category are scrap mica, block mica that will trim to a size less than 1 by 1 inch, splittings used in making built-up mica, and the so-called "electric" mica. The definition of strategic mica, however, is by no means fixed, and the meaning of the term varies with changes in military needs, anticipated future requirements, and conditions of supply. Most strategic mica is simply sheet material of superior quality. Gwinn [27] suggests the alternative term "mica of military grade," which would include all sizes and qualities of mica used in the manufacture of equipment for the armed forces. He further suggests that "strategic" mica then would be the quality or sizes in short supply at a particular time. In 1944 the Army and Navy Munitions Board approved the definition of strategic materials (including mica) as those "required for essential uses in a war emergency, the procurement of which in adequate quantities, quality, and time is sufficiently uncertain for any reason to require prior provision for the supply thereof."

ELECTRICAL METHODS

Owing to increasing demands for high-quality mica in electrical equipment, attention has been focused during recent years upon grading and classification of sheet material in terms of electrical properties. It has been noted that the dielectric constant of muscovite that is otherwise of good quality is uniformly within the required limits prescribed for condenser use and that consequently there is little need for further systematic determination of this property. However, such other properties as dielectric strength, electrical conductivity, and power factor are of considerable significance in predicting how well given sheets or lots of mica will serve in finished condensers.

The American Society for Testing Materials [28] has adopted standard methods of test for dielectric strength of electrical insulating materials at commercial power frequencies. In the testing of muscovite, high voltages are applied to cleavage plates of measured thickness by means of metal electrodes. The electrode contact surfaces can be either rounded or flat, but one type or the other should be used in any tests where direct comparison of results is desired. The A. S. T. M. standards [29] specify metal disks 1 inch thick and 2 inches in diameter, with edges rounded to a radius of a quarter of an inch. The tests are made under conditions of temperature and humidity closely approximating those under which the particular lot of mica is to be ultimately used. Similarly, the mica is tested in air or oil, depending upon the type of immersion to be employed in the finished electrical equipment.

The magnitude of the break-down or rupture voltage ordinarily varies with the period of time during which the voltage is applied, and most electrical insulating materials are more resistant to voltages applied briefly than to comparable voltages applied over longer periods. For this reason two types of test are commonly used. For short-time determination of dielectric strength, the voltage is increased from zero to the break-down value at a uniform rate, generally 0.5 or 1.0 kilovolt per second.[30] In the long-time or step-by-step test, the initial applied voltage is equal to about half the break-down voltage as determined by the short-time test. This voltage is subsequently increased by equal increments, the duration of each "voltage step" being determined from specifications for the material involved.

The break-down voltage of an insulating material decreases in value with increase in frequency of the applied current, so that the dielectric strength generally is lower at radio frequencies than at audio frequencies. At high frequencies the currents flowing in a dielectric material produce heat, corona, flash-over, blistering, or other deterioration, with a subsequent change in values of current and voltage as application continues. Application by means of different types of electrodes, as well as other variations in test procedure, are briefly discussed by Horton.[31]

Mica sheets or films can be tested for electrically conducting impurities according to the standard methods of test, established by the American Society for Testing Materials, for conducting paths in electrical slate.[32] The mica is laid on a metal plate, and its upper surface is then explored by means of a pointed, probelike electrode. The electrode and plate are connected to the output terminals of a vibration-type spark coil operating on an input voltage of 6. The secondary windings should be capable of forming a ⅜- to 1-inch spark between two needle points. A battery-operated spark test set, developed during the recent wartime period by the Bell Telephone Laboratories, is a compact instrument that permits rapid

[27] Gwinn, G. R., Strategic mica: U. S. Bur. Mines Inf. Circ. 7258, p. 3, 1943.

[28] American Society for Testing Materials, Standard methods of test for dielectric strength of electrical insulating materials at commercial power frequencies, A. S. T. M. Designation: D 149–44: 1946 Book of A. S. T. M. Standards, pt. 3–B, pp. 124–130, 1947.

[29] Idem, p. 126.

[30] American Society for Testing Materials, Standard methods of test for dielectric strength of electrical insulating materials at commercial power frequencies, A. S. T. M. Designation: D 149–44: 1946 Book of A. S. T. M. Standards, pt. 3–B, p. 129, 1947.

[31] Horton, F. W., Mica: U. S. Bur. Mines Inf. Circ. 6822, pp. 32–33, 1935 (revised 1941).

[32] American Society for Testing Materials, Standard methods of test for conducting paths in electrical slate, A. S. T. M. Designation: D 273–40: 1946 Book of A. S. T. M. Standards, pt. 3–B, pp. 131–134, 1947; Tentative specifications for natural block mica and mica films suitable for use in fixed mica-dielectric capacitors, A. S. T. M. Designation: D 748–45T: 1946 Book of A. S. T. M. Standards, pt. 3–B, pp. 705–717, 1947.

exploration of block and film mica for conducting impurities (pl. 9; fig. 11).

Such mechanical imperfections as pinholes, hair cracks, and tears in the mica permit ready passage of the spark from electrode to plate during a test, and those that do not extend entirely through the sheet generally cause puncture or rupture. Similar failure is not ordinarily caused by conducting impurities, however. These are revealed instead by a distinct sparking or glowing in the mica, observation of which is best made in a room with subdued lighting.

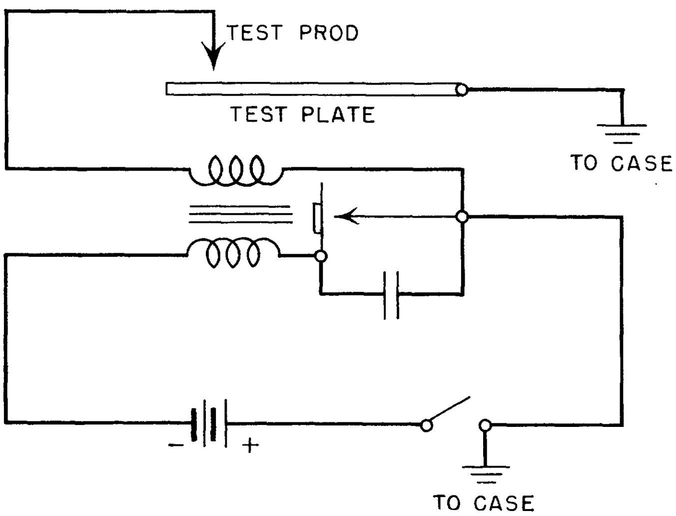


FIGURE 11.—Simplified circuit of spark-coil set for testing sheet muscovite. Courtesy of the Bell Telephone Laboratories, Inc.

Determination of power loss of muscovite is of great value in estimating the quality of condenser-grade material, particularly if it is to be used in high-frequency circuits. Such loss is best expressed in terms of power factor, *Q* value (reciprocal of power factor), or heat equivalent. Systematic measurements of power factor have been made in steadily increasing numbers during recent years and have yielded much useful information. The National Bureau of Standards has been particularly active in this connection.

A resistance-variation method was used in a series of power-factor tests by E. L. Hall and others [33] on mica specimens submitted by the Federal Bureau of Mines, and the results of these tests were first reported in 1931.[34] Subsequent tests in the laboratories of the Bureau of Standards were made by a much more rapid bridge method, in which a preliminary capacitance measurement of a given specimen is made with a radio-frequency bridge, followed by (1) an adjustment of the bridge power-factor dial to zero with respect to a standard air condenser and (2) measurement of the power factor of the specimen by means of a power-factor dial on the bridge. Each test specimen is made into a simple condenser by means of metal-foil electrodes fastened with a little petroleum jelly. Full descriptions of this method have been made by Hall.[35]

A method of test tentatively adopted by the American Society for Testing Materials [36] is similar to the above method but specifies cleaning, heating, and drying of the samples before testing, use of steel or mercury electrodes arranged in such a way that two pieces of mica are required for each test, and enough determinations of power factor for different electrode pressures to obtain a pressure-power factor curve. The Bureau of Standards tests ordinarily are made on single pieces of mica, without any special procedure in pretreatment of the samples and without any attempt to determine changes in power factor with changes in electrode pressure.[37]

The time required for an ordinary power-factor determination of mica has been reduced during recent years to about 3 minutes, but prospects for further quickening of the usual method do not appear to be good. Thus it remains too slow for commercial use, as far as its inclusion in any combined visual-electrical testing procedure is concerned. More rapid techniques for estimating power loss in mica have been described,[38] and a very useful instrument was developed by the Bell Telephone Laboratories in response to an appeal from the War Production Board in 1942. This instrument, a resonant-circuit test set known as a Q-meter (pl. 9), is used for direct determination of *Q* value, or reciprocal of the power factor. As shown in figure 12, it consists essentially of a high-frequency oscillator, a vacuum-tube voltmeter, an inductance with a *Q* value of at least 300 at 1 megacycle, an adjustable capacitor with a maximum of about 10 micromicrofarads, and a fixed low-loss air capacitor of about 20 micromicrofarads. When used, the circuit is first tuned to the applied frequency, and a full-scale voltmeter reading is obtained across the air condenser by appropriate adjustment of the input. When the test piece of mica is inserted in series with the fixed air condenser, the adjustable condenser is

[33] Horton, F. W., op. cit., pp. 41–46.

[34] Lewis, A. A., Hall, E. L., and Caldwell, F. R., Some electrical properties of foreign and domestic micas and the effect of elevated temperatures on micas: Nat. Bur. Standards Jour. Research, vol. 7, research paper 347, 1931.

[35] Hall, E. L., Report on measurement of power factor in muscovite, in Kesler, T. L., and Olson, J. C., Muscovite in the Spruce Pine district, N. C.: U. S. Geol. Survey Bull. 936–A, pp. 18–24, 1942; Equipment and method for measurement of power factor of mica: Inst. Radio Eng. Proc., vol. 32, pp. 394–395, 1944; Power factors, in Hidnert, Peter, and Dickson, George, Some physical properties of mica: Nat. Bur. Standards Jour. Research, vol. 36, pp. 342–344, 1945.

[36] American Society for Testing Materials, Tentative methods of test for power factor and dielectric constant of electrical insulating materials, A. S. T. M. Designation: D 150–46T: 1946 Book of A. S. T. M. Standards, pt. 3–B, pp. 647–681, 1947.

[37] Hall, E. L., Equipment and method for measurement of power factor of mica: Inst. Radio Eng. Proc., vol. 32, p. 395, 1944.

[38] Barber, A. W., Simplified dielectric loss measurements: Inst. Radio Eng. Proc., vol. 17, p. 26, 1937; Snow, H. A., Losses in mica and simple test procedure: Inst. Radio Eng. Proc., vol. 17, p. 19, 1937.

used to reestablish resonance, and the voltmeter reading is then compared with the original full-scale reading. The series resistance causing the voltage drop is the measure of the power loss in the mica. More detailed descriptions and analyses of Q-meter operations appear in the published record.[39]

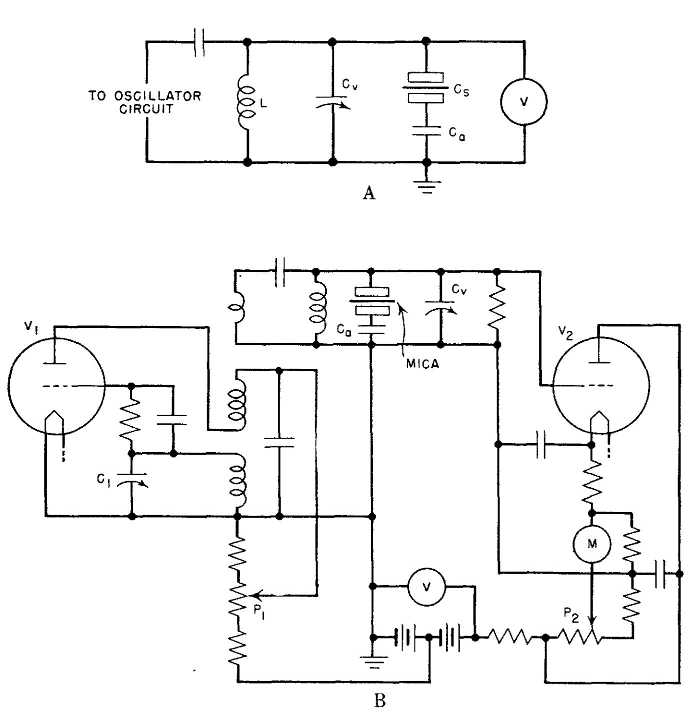


FIGURE 12.—Simplified circuits of equipment for determining power factor of sheet muscovite. Courtesy of the Bell Telephone Laboratories, Inc. *A*, Circuit indicating general method of testing: L, inductance; C_v, adjustable capacitance; C_a, fixed air condenser; C_s, condenser with test piece of mica as the dielectric; V, voltmeter. *B*, Simplified circuit of rapid-reading Q-meter: V_1, tube of oscillator circuit; C_1, adjustable capacitance; C_v, adjustable capacitance; P_1, P_2, variable resistances; V, voltmeter; V_2, tube of vacuum-tube voltmeter; M, meter of vacuum-tube voltmeter; C_a, fixed air condenser.

The Q-meter of the Bell Telephone Laboratories was first tested for calibration on small lots of sheet mica, and since that time it has been employed in numerous types of testing programs. It has been shown that its usefulness can be extended, through proper calibration, to permit direct reading of capacitance, dielectric constant, and absolute value of *Q* or power factor.[40] The thickness of each test specimen must be dealt with in this connection (fig. 13), although the calibration for *Q* value is based fundamentally on the probable *Q* values of capacitors made from splittings of the mica.[41] The meter was designed more as a fast and simple means for electrical grading of mica than as a precision instrument; nevertheless, it yields *Q* values that agree closely with determinations made by means of other, more exact, methods.

COMBINATION METHOD OF THE AMERICAN SOCIETY FOR TESTING MATERIALS

Tests aimed at correlation of electrical properties of sheet muscovite with its behavior under actual use in condensers have been made from time to time by manufacturers of electrical equipment. Most of these tests have been used to solve specific problems encountered during production, rather than to establish basic generalizations; hence few have provided comprehensive information or have involved material of specifically known source. In response to a growing need for more systematic data, the United States Geological Survey, the National Bureau of Standards, the R. C. A. Manufacturing Co., and the Scintilla Magneto Division of the Bendix Aviation Corp. determined the relations between power factor and visual characteristics and between these properties and utility in built-up condensers for several samples of muscovite from mines in the southeastern United States. This work was done in 1940 and 1941, and the results were summarized and discussed by Kesler and Olson in 1942.[42] The investigations were limited in scope by the small quantities of raw mica available for testing, but both the manufacturing organizations concluded that most of this mica compared favorably with India mica in dielectric strength and power factor. It was pointed out, however, that the proportionate yield of finished films was inferior to that from India mica, owing mainly to relatively poor preparation of the domestic material.

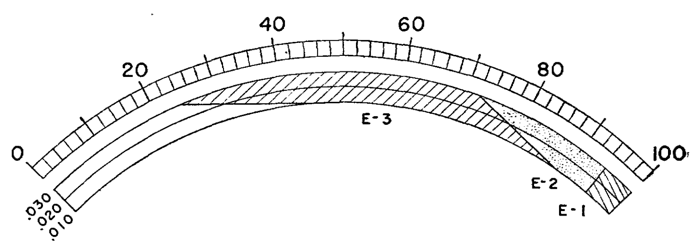


FIGURE 13.—Meter scale of the Bell Telephone Laboratories' Q-test set, showing the relation between power-factor groups (E–1, E–2, and E–3) and thickness of test pieces (0.010-, 0.020-, and 0.030-inch controls).

A much more extensive series of investigations was begun in 1942 by the Bell Telephone Laboratories at the request of the War Production Board. Block mica from seven domestic mines was classified according to *Q* value by the rapid method and was tested for conducting impurities with the spark set. This electrically selected material, much of which was marred by

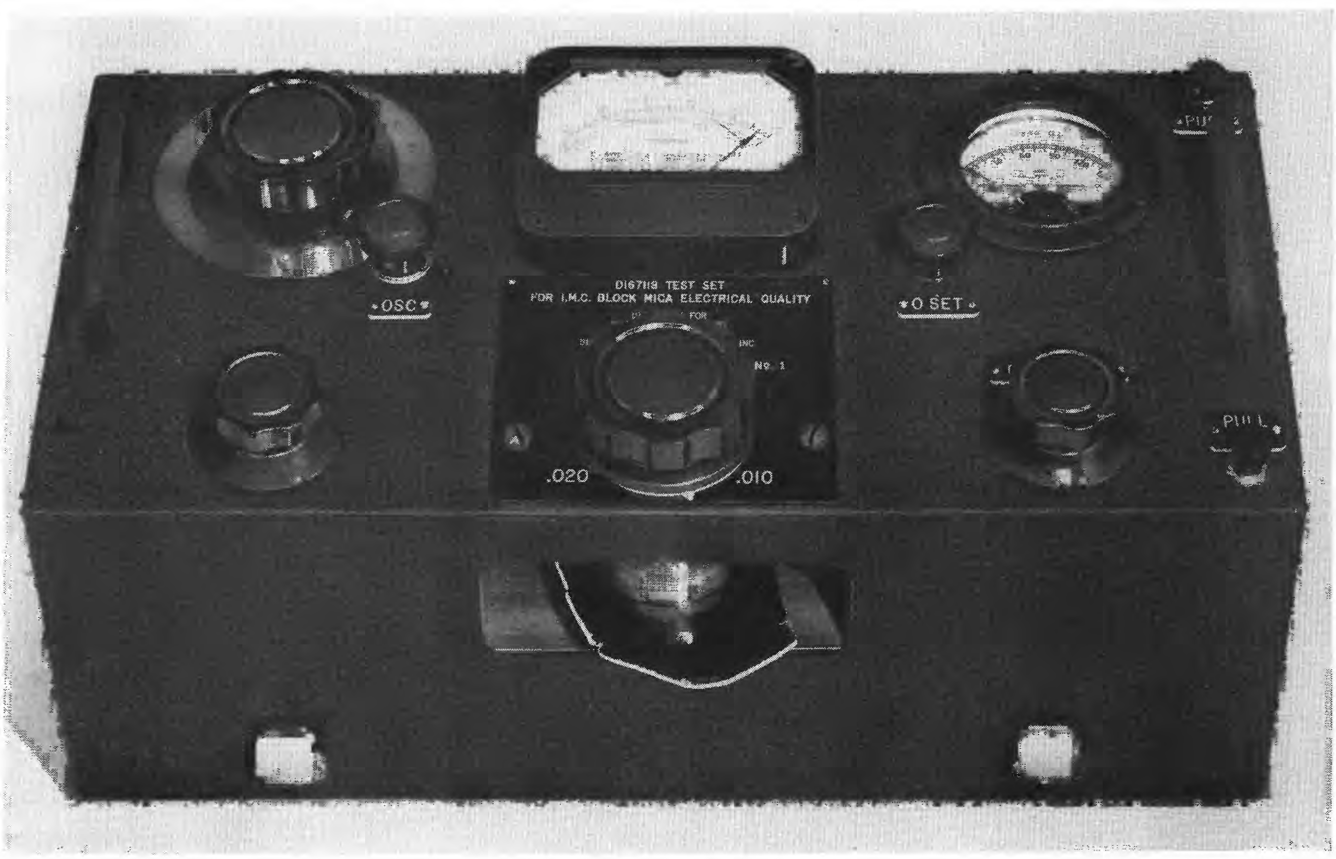
[39] Coutlee, K. G., Saving mica by testing: Bell Lab. Rec., vol. 22, pp. 509–513, 1944; Progress report on A. S. T. M. round robin power factor tests of block mica, Am. Soc. for Testing Materials, sec. 3, subcommittee 9, and Bell Telephone Lab., Inc., New York, 8 pp., 1945; Judging mica quality electrically: Am. Inst. Electrical Eng. Trans., vol. 64, pp. 1–7, 1945.

[40] Coutlee, K. G., Judging mica quality electrically: Am. Inst. Electrical Eng. Trans., vol. 64, pp. 2–3, 1945.

[41] American Society for Testing Materials, Tentative specifications for natural block mica and mica films suitable for use in fixed mica-dielectric capacitors, A. S. T. M. Designation: D 748–45T: 1946 Book of A. S. T. M. Standards, pt. 3–B, pp. 705–717, 1947.

[42] Kesler, T. L., and Olson, J. C., Muscovite in the Spruce Pine district, N. C.: U. S. Geol. Survey Bull. 936–A, pp. 18–30, 1942.

A. SPARK-COIL SET FOR RECOGNITION OF PINHOLES, CRACKS, AND CONDUCTING IMPURITIES



B. RAPID, DIRECT-RE · DING Q-METER

TESTS SETS FOR ELECTRICAL CLASSIFICATION OF SHEET MICA

Courtesy of the Bell Telephone Laboratories, Inc.

air stain and inclusions of iron oxide, was then split, punched, and built up into molded 1,000- and 4,000-micromicrofarad capacitors by the Western Electric Co. In subsequent performance tests these capacitors, as noted by Coutlee,[43]

> satisfactorily met Q, insulation-resistance, dielectric-strength, corona-voltage and life requirements. . . . As a result of these tests, it was concluded that block mica could be selected dependably for use in capacitors, some for the better grades and the rest for less critical types, and that the test methods appeared entirely adequate for the electric control of capacitor mica. Even the two lots of capacitors made with block mica in which conducting inclusions were detected by the spark test and low Q by the block mica Q tests gave excellent dielectric strength and life performance.

A new set of specifications for condenser-quality mica, based upon electrical, physical, and visual requirements, was then developed in terms of all available testing data, and checking of these specifications on a commercial scale was started immediately thereafter. This involved electrical classification of more than a ton and a half of block mica from Brazil, Canada, India, and the United States. Twenty-two different types of material were included. All the mica had been previously qualified, by visual means alone, as stained or poorer according to the India scale or as No. 2, No. 2 inferior, or No. 3 according to the domestic scale. The blocks were split, punched, and made up into more than 47,000 capacitors of various types by eight manufacturers. Results of performance tests on these capacitors, which have been recorded and discussed in detail elsewhere,[44] led to the conclusion that electrical-visual methods of selection can be satisfactorily applied to capacitor-grade mica required for given end uses.

A set of specifications for commercial sheet mica, based upon a combination of visual and electrical tests, was subsequently proposed by the American Society for Testing Materials.[45] The system of classification based upon these specifications has been tested commercially and "found to be both practicable and reliable." It

> does not discriminate against the presence of spots or stains in even first quality electrically selected mica providing the mica conforms to specific electrical and physical requirements. Appreciable amounts of air inclusions and waviness also are permitted in all electrical quality classes providing the mica meets specific electrical and physical requirements. However, such mica is not considered generally as desirable as mica having lesser amounts of such defects. Mica capable of meeting specific requirements also may be of any basic color such as white, ruby, light green, dark green, brownish green, rum, or other colors derived from any source.

In this latest A. S. T. M. method of classification the mica is graded for size according to the so-called India scale (figs. 9, 10) and is qualified according to certain electrical, visual, and other physical features by means of carefully specified methods. Division into three general classes is accomplished by evaluation of several properties as shown in table 3. Standard procedures are recommended for determination of visual properties, dielectric strength, and other characteristics, and two methods for determining Q value or power factor are recognized as satisfactory.

TABLE 3.—*Electrical, physical, and visual quality requirements of natural block mica and mica films for use in capacitors*

[Adapted from A.S.T.M. specifications]

	C–1	C–2	C–3
Electrical properties:			
Conductivity	None	None	None.
Q value or power factor at 1 megacycle	[1] E–1	[1] E–2	[1] E–3.
Dielectric strength (volts per mil at 60 cycles per second), minimum:			
Average	1,000	1,000	1,000.
Single	850	850	850.
Dielectric constant	(2)	(2)	(2)
Physical properties:			
Weight loss on heating (5 minutes at 600° C.), maximum percent	0.2	0.2	
Thickness uniformity (mica films)[3]	Best	Best	Intermediate.
Temperature coefficient of capacitance and retrace	(4)	(4)	(4)
Visual qualities:			
Air inclusions:[5]			
A	None to slight	None to slight	None to slight.
B	Medium	Medium	Medium.
C	Medium to heavy	Medium to heavy	Medium to heavy.
Waves:[6]			
A	Flat to slight	Flat to slight	Flat to slight.
B	Medium	Medium	Medium.
C	Medium to heavy	Medium to heavy	Medium to heavy.
Cracks	None	None	None.
Tears	None	None	None.
Pinholes	None	None	None.
Stones	None	None	None.
Buckles	None	None	None.
Ridges	None	None	None.

[1] See table 4 for corresponding values of Q and power factor.
[2] No specified requirement is needed.
[3] Until definite values can be specified, the permissible amounts of such defects shall be agreed upon by the purchaser and the manufacturer.
[4] It has been found that the temperature coefficient of capacitance and retrace of capacitors made with classes C–1, C–2, and C–3 are more dependent on such factors as electrical and mechanical design and manufacturing technique than any differences that may be attributed to the mica itself.
[5] The amount of air inclusions shall not exceed the specified limits for each subclass as judged by the photographic reference standards given in figures 1–3 on pages 708–713 of the 1946 Book of A. S. T. M. Standards. The permissible amount of air inclusions shall be stated by suffixing the letter A, B, or C, as the case may be, to the required electrical-quality class.
[6] Until definite values can be specified, the permissible amount of waves, buckles, and ridges shall be agreed upon by the purchaser and the manufacturer. The permissible amount of waves shall be stated by suffixing the letter A, B, or C, as the case may be, to the letter denoting the amount of permissible air inclusions. For example, class C–1 B A block mica films are of the best electrical quality with a medium amount of air inclusions and an absence, or only a slight amount, of waves.

[43] Coutlee, K. G., Judging mica quality electrically: Am. Inst. Electrical Eng. Trans., vol. 64, p. 6, 1945.

[44] Townsend, J. R., Final report on commercialization of mica testing equipment: War Production Board, War Metallurgy Comm. Rept. W–151, 1944; Townsend, J. R., Addendum to War Metallurgy Comm. Rept. W–151: War Production Board Rept. W–170, 1944; Coutlee, K. G., Saving mica by testing: Bell Lab. Rec., vol. 22, pp. 509–513, 1944; Coutlee, K. G., Progress report on A. S. T. M. round robin power factor tests of block mica, Am. Soc. for Testing Materials, sec. 3, subcommittee 9, and Bell Telephone Lab., Inc., New York, 8 pp., 1945; Coutlee, K. G., Judging mica quality electrically: Am. Inst. Electrical Eng. Trans., vol. 64, pp. 1–7, 1945.

[45] American Society for Testing Materials, Tentative specifications for natural block mica and mica films suitable for use in fixed mica-dielectric capacitors, A. S. T. M. Designation: D 748–45T: 1946 Book of A. S. T. M. Standards, pt. 3–B, pp. 705–717, 1947.

On the basis of its *Q* value, mica can be divided into the three groups shown in table 4. These are designated E–1, E–2, and E–3. E–1 mica that is flat to only slightly wavy, contains no conducting impurities and little or no air stain, and is free from cracks, tears, pinholes, stones, buckles, and ripples corresponds to fair stained or better material in the older, strictly visual, classifications and yields films of top quality, as may be seen in the following tabulation of approximate equivalents between electrical quality and visual quality based on an A. S. T. M. table:

Electrical quality (A. S. T. M. Specifications D 748)	*Visual quality (A. S. T. M. Methods D 351)*	
Block mica and mica films	*Block mica*	*Mica films*[1]
Class C–1 AA	Fair stained (min.)	First quality
Class C–1 BB	Good stained	Second quality
Class C–1 CC	Stained	Third quality

[1] Mica-film quality is not specified in A. S. T. M. Methods D 351. The qualities given are in commercial use, and the equivalent block-mica quality is assumed.

TABLE 4.—*Q and power-factor values for electrical-quality groups E–1, E–2, and E–3*
[Adapted from A. S. T. M. specifications]

Q or power-factor group	Form of mica	*Q* value	Power factor	Rapid-method meter reading (thickness of block mica or stacked mica films, in inches)		
				0.010 (0.007–0.015)	0.020 (0.015–0.025)	0.030 (0.025–0.035)
E–1	Block Films	2500 (min.) [1] 2500 (min.) [2]	0.0004 (max.) 0.0004 (max.)	95–100	95–100	95–100
E–2	Block Films	350–2500 [1] 1500 (min.) [2]	0.00285–0.0004 0.00066 (max.)	87–95	77–95	71–95
E–3	Block Films	50–350 [1] 200–1500 [2]	0.02–0.00285 0.005–0.00066	50–87	32–77	24–71

[1] Extensive commercial tests have verified the validity of the *Q* values of capacitors made with group E–1 block mica to a satisfactory degree. However, the ranges for groups E–2 and E–3 are tentative and subject to further verification.
[2] Minimum *Q* values for material purchased as films and tested in stacks of films 0.010 to 0.030 in. in thickness and probable minimum *Q* values of molded-type, 1,000-mmf., stacked-foil, and silvered capacitors. These will apply when all factors that would adversely influence the *Q* value are under control.

These equivalents are valid only if the *Q* value of the mica is E–1. Such mica "is suitable for use in all sizes and types of silver and foil electrode molded and clamped unit capacitors, including the most critical types, for use in high stability tuned circuits, as well as high current radio frequency capacitors used in radio transmitter circuits."[46] Mica that is graded as E–2 and has the other characteristics of class C–2 is also suitable for such condensers, although "a certain percentage of capacitors made with class C–2 block mica and films may show a somewhat higher temperature rise in transmitter types than capacitors made with class C–1 block mica or mica films."[47] Mica of class C–3 (E–3 in terms of *Q* value), though not of top quality, is none the less suitable for use in condensers where high *Q* value, high stability, and low temperature coefficient are not required.

PREPARATION AND MARKETING

The first rough separation of mica generally is made at the mine—at the face or portal, in a nearby shed, or on the dump at a later time (fig. 14). Obvious mine scrap is separated from the better books, from which adhering fragments of quartz, feldspar, and other foreign material are then cobbed. Some of this rough-cobbed or selected mine-run mica is sold as such to jobbers or manufacturers, but at many mines it is prepared further. The books are split or rifted by means of a blade into plates that generally are less than three-sixteenths of an inch thick. Through skilled handling of the rifting knife, defective laminae are removed with a minimum waste of higher-quality material, and block mica, punch and washer stock, and bench or shop scrap are thereby obtained. In some

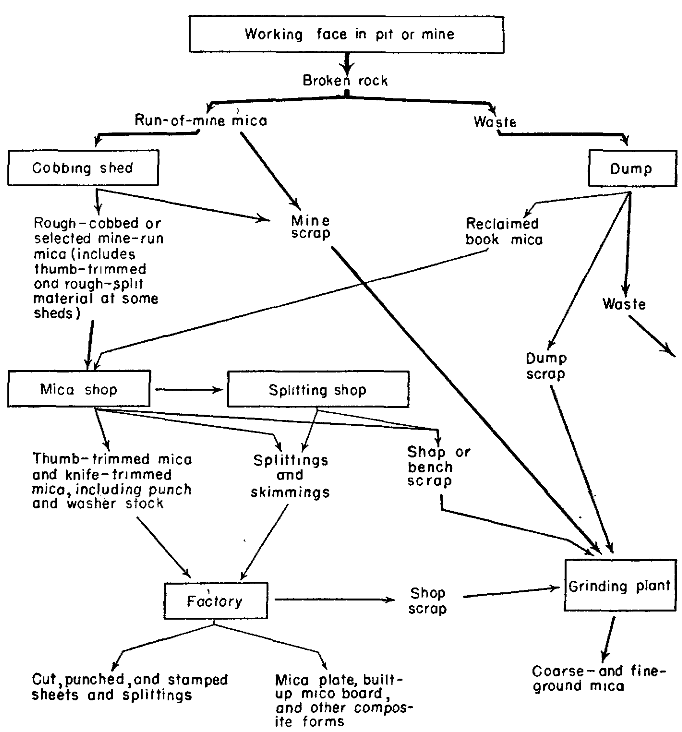


FIGURE 14.—Outline of operations involved in the extraction and preparation of sheet, punch, and scrap mica.

[46] American Society for Testing Materials, Tentative specifications for natural block mica and mica films suitable for use in fixed mica-dielectric capacitors, A. S. T. M. Designation: D 748–45T: 1946 Book of A. S. T. M. Standards, pt. 3–B, p. 706, 1947.
[47] Idem, p. 707.

districts the cobbed mica is commonly split into plates more than three-sixteenths of an inch thick, but both these and the thinner riftings are generally known as "plate" mica. As such, they constitute a specially selected form of mine-run material.

After rifting, the ragged and broken edges of many plates are removed with the fingers, a process known as "thumb trimming." This is an especially common practice in districts where much of the mica is severely ruled or marked by "A" structure. Some thumb-trimmed material may be sold to manufacturers as such, or it may be further trimmed with a knife and its value thereby increased. Some mica is trimmed with shears, but most is cut by a sickle or hand knife. As pointed out by Spence,[48] material from which waste has been removed by a mechanical knife, guillotine, or shears is known in the trade as "knife-trimmed" or "shear-trimmed." It has unbeveled edges that generally are straight or nearly straight. Mica trimmed by hand, with beveled and less regular edges, is termed "sickle-trimmed." This distinction is not often made, however, in the preparation of domestic mica, and material trimmed with a hand knife is commonly referred to as "knife-trimmed." During recent years attempts have been made to employ several forms of blades and saws for mica trimming in the United States, but without much success.

Most India mica is knife-trimmed or sickle-trimmed free of cracks and flaws, but domestic procedure is somewhat different. Half-trimmed mica, for example, is cut on two adjacent sides with no cracks, reeves, cross grains, nor ribs extending from those sides. Three-quarter-trimmed mica is cut on all sides, with no cracks nor comparable flaws extending from two adjacent sides or into the final pattern area. Only full-trimmed mica is comparable to India-trimmed material in that it is cut on all sides and contains none of the flaws noted above. Moreover, upper limits generally are set on the number and size of "V" or figure cuts on any one piece of mica, as well as on the proportion of pieces with such cuts in a given lot of mica.

Careful rifting and trimming are very important in the preparation of sheet mica, not only because waste is thereby held to a minimum, but because well-prepared mica yields a higher proportion of usable material in the later stages of manufacture. The mica may be rifted, or it may be trimmed to the required degree of quality, and the process adopted depends chiefly upon the kind and distribution of impurities and structural imperfections that the mica contains.

A large proportion of sheet mica is consumed in the form of splittings. These are films 0.0007 to 0.001 inch thick that generally are cleaved from punch and the smaller sizes of sheet stock. Some are derived, also, from thin films or skimmings that are a byproduct of the rifting of larger sheet material. Splittings are used in the manufacture of built-up mica board and other forms of electrical insulation. Although many mechanical devices have been tested for the preparation of these films, practically all are still split outside the United States by hand methods, generally in places where labor costs are very low.

The cut mica blocks that represent punch, circle, and larger sheet stock are processed into disks, washers, and thin plates of various sizes and shapes. This generally involves additional splitting, followed by trimming, cutting, or stamping into more or less standardized patterns. Most of this material is then cut to final form, if necessary, by the manufacturers of the devices in which the mica is to be used. Composite forms can be built up to any desired thickness by the cementing of individual pieces with shellac, glyptol, or a similar bonding medium. In general only a small proportion of the prepared block material is represented in the finished product. The bulk of such material is skimmed or cut away as waste, which is marketed as scrap of superior grade.

Most scrap mica, including material derived from nonpegmatitic sources, is processed by grinding. It is classified on the basis of its freedom from quartz, feldspar, and other gritty impurities and on the basis of its color when ground.

Prices for sheet mica not only fluctuate widely in response to variations in demand, but vary at any given time according to the size and quality of the material. The general ranges for clear and stained trimmed sheet mica in the Southeastern States during a 30-year period are shown in table 5. The value of punch or untrimmed small sheet mica ranged from 2½ cents to about 15 cents per pound during the same period. Trimmed electric (stained sheet) mica is sold according to a sliding price scale, with values consistently lower than those for clear material of comparable size. Electric mica also is sold as thumb-trimmed block, generally at prices that vary according to the estimated proportion of waste. Many

TABLE 5.—*Price ranges of clear and stained sheet mica in the Southeastern States during the period 1910–40*

Size (inches)	Range in price per pound (dollars and cents)	
	Clear	Stained
1½ by 2	0.12–0.60	(1)
2 by 2	.22–1.05	0.06–0.40
2 by 3	.38–1.45	.10– .60
3 by 3	.58–2.00	.15–1.25
3 by 4	.78–2.30	.30–1.50
3 by 5	.95–2.70	.48–1.75
4 by 6	1.75–3.65	1.70–2.25
6 by 8	2.25–7.25	1.25–2.50
8 by 10	3.50–11.50	2.00–3.00

1 Under ordinary conditions the smallest size of stained mica purchased as sheet material in the Southeastern States is 2 by 2 inches.

48 Spence, H. S., Mica: Canada Dept. Mines, Mines Branch, Pub. 701, p. 54, 1929.

jobbers purchase selected mine-run material (either clear or stained), rift and trim it, and sell the prepared mica to manufacturers. Others purchase punch and washer stock from which they recover and trim sheet material, and still others have recovered sheet and punch mica from mine scrap. Buyers of mica are listed in United States Bureau of Mines Information Circular 7258.

During war periods, when the demand for sheet mica is greatly increased and the problems of supply are often complex, prices reach very high levels. The rising trend during the period December 1941–December 1944 and the subsequent sharp drop in prices are shown in table 6. Through parts of 1942 and 1945 strategic-quality mica was purchased by private individuals and organizations and by the Colonial Mica Corporation as well, but during most of the wartime period purchases were made solely by the Colonial Mica Corporation. With the end of hostilities and the trend toward peacetime economy, most of the subsidies for mica production were removed and the prices for sheet material dropped sharply. The attendant closing of many mines and general diminution of sheet-mica production curtailed the supply of punch and washer material, so that prices for such mica actually remained at wartime levels or even rose. During 1945, for example, some lots of punch mica were sold at prices of 45 to 50 cents per pound.

TABLE 6.—*Price schedules for domestic clear sheet mica during the period December 1941–February 1945*

[Adapted in part from Billings and Montague, The wartime problem of mica supply: Eng. and Min. Jour., vol. 145, no. 8, p. 94, 1944]

Size	Price per pound, in dollars and cents											
	Private purchasers		Colonial Mica Corporation									Private purchasers, February 1945 [7]
									February 1945 [6]			
	December 1941	April–May 1942	June 1942 [1]	November 1942 [1]	May 1943 [2]	February 1944 [2, 3]	August 1944 [4]	February 1945 [5]	No. 1 quality	No. 2 quality	No. 2 inf. quality	
Punch	0.10–0.15	0.12–0.16	0.22	0.30					1.70–3.50	1.25–2.50	0.50–1.10	0.08–0.15
1½ by 2 inches	.45– .65	.50– .65	1.10	2.40					5.00	3.50	1.60	1.00
2 by 2 inches	.60– .85	.95–1.10	1.75	3.52								1.40
2 by 3 inches	1.30–1.50	1.50–1.85	2.75	4.64					7.80	5.50	2.60	2.00
3 by 3 inches	1.90–2.05	2.00–2.35	3.50	5.12	5.00	6.00	6.00 & 8.00	2.25	9.10	6.50	3.40	2.55
3 by 4 inches	2.15–2.25	2.25–2.60	4.25	6.08								3.00
3 by 5 inches	2.60–2.75	2.75–3.00	5.00	7.04					10.50	7.10	4.65	3.45
4 by 6 inches	3.60–3.70	3.75–4.00	6.25	8.00					13.30	8.30	6.20	4.30
6 by 8 inches	5.25–5.50	5.50–6.00	8.00	9.12					20.10	12.70	9.20	6.50

[1] Punch material required to yield 20 percent or more of trimmed pieces 1 by 1 inch or larger; price scale for larger mica based on No. 1 quality and half trim, with maximum bonuses of 30 and 40 percent for three-quarter trim and full trim, respectively.
[2] Uniform price per pound established regardless of size or quality within strategic range. Punch material required to be full-trimmed; sheet mica, three-quarter-trimmed.
[3] Includes $1 bonus.
[4] Premium price of $8 paid for full-trimmed sheet mica 2 by 2 inches in size and larger; $6 for full-trimmed punch material and full-trimmed sheet mica smaller than 2 by 2 inches and for three-quarter-trimmed sheet in the larger sizes.
[5] Blanket price for full-trimmed sheet and punch mica regardless of size or quality within strategic range; drop in price reflects general subsidy-removing policy with respect to production of strategic mica.
[6] Alternative price schedule based on size and quality of three-quarter-trimmed mica.
[7] Price based on untrimmed punch and three-quarter-trimmed sheet mica.

SHEET MUSCOVITE IN THE SOUTHEASTERN STATES

DISTRIBUTION OF DEPOSITS

The Southeastern States constitute the chief mica-producing area in the United States. The bulk of this production is obtained from mines in western North Carolina, but important deposits also are worked in parts of Virginia, South Carolina, Georgia, and Alabama. Fourteen well-defined mica-mining districts occupy a belt nearly 600 miles long and about 60 miles in average width. It extends from east-central Virginia southwestward through the western Carolinas and north Georgia to central Alabama (fig. 15). This general mica-producing region can be divided into two smaller belts: the Blue Ridge belt of North Carolina and Georgia on the northwest and the longer and broader Piedmont belt on the southeast. Within the Blue Ridge belt are the Jefferson-Boone, Wilkes, Spruce Pine, and Buncombe districts of North Carolina; the Franklin-Sylva district of North Carolina and Georgia; and the North Georgia district. The Piedmont belt comprises the Amelia district of Virginia; the Ridgeway-Sandy Ridge district of Virginia and North Carolina; the Shelby-Hickory district of North Carolina; the Hartwell district of Georgia and South Carolina; the Thomaston-Barnesville district of Georgia; and three districts in east-central Alabama. Many small deposits are scattered through the areas between and around individual districts.

The Spruce Pine district, which occupies parts of Avery, Mitchell, and Yancey Counties in the Blue Ridge province of western North Carolina, is the largest in North America, both in annual and total production of mica and in the number of mines and prospects that lie within its limits. Since 1900 the output from at least 800 mines has been marketed and hundreds of other deposits have been prospected. The number of mica deposits that have been mined or prospected throughout the entire southeastern part of the United States probably amounts to 4,900 or more. Table 7 is a tabulation, by districts, of the number of deposits from which strategic-quality mica was obtained during the period of World War II, the number of deposits studied in detail by the United States Geological Survey during the period 1939-46, and the estimated minimum number of deposits worked since 1880. There is little correlation between the number of mica mines and prospects in a district and its areal extent (fig. 15). The Spruce Pine district, for example, occupies an area of 250 square miles or less, whereas the much more extensive Buncombe district to the south probably contains less than one-twentieth as many deposits.

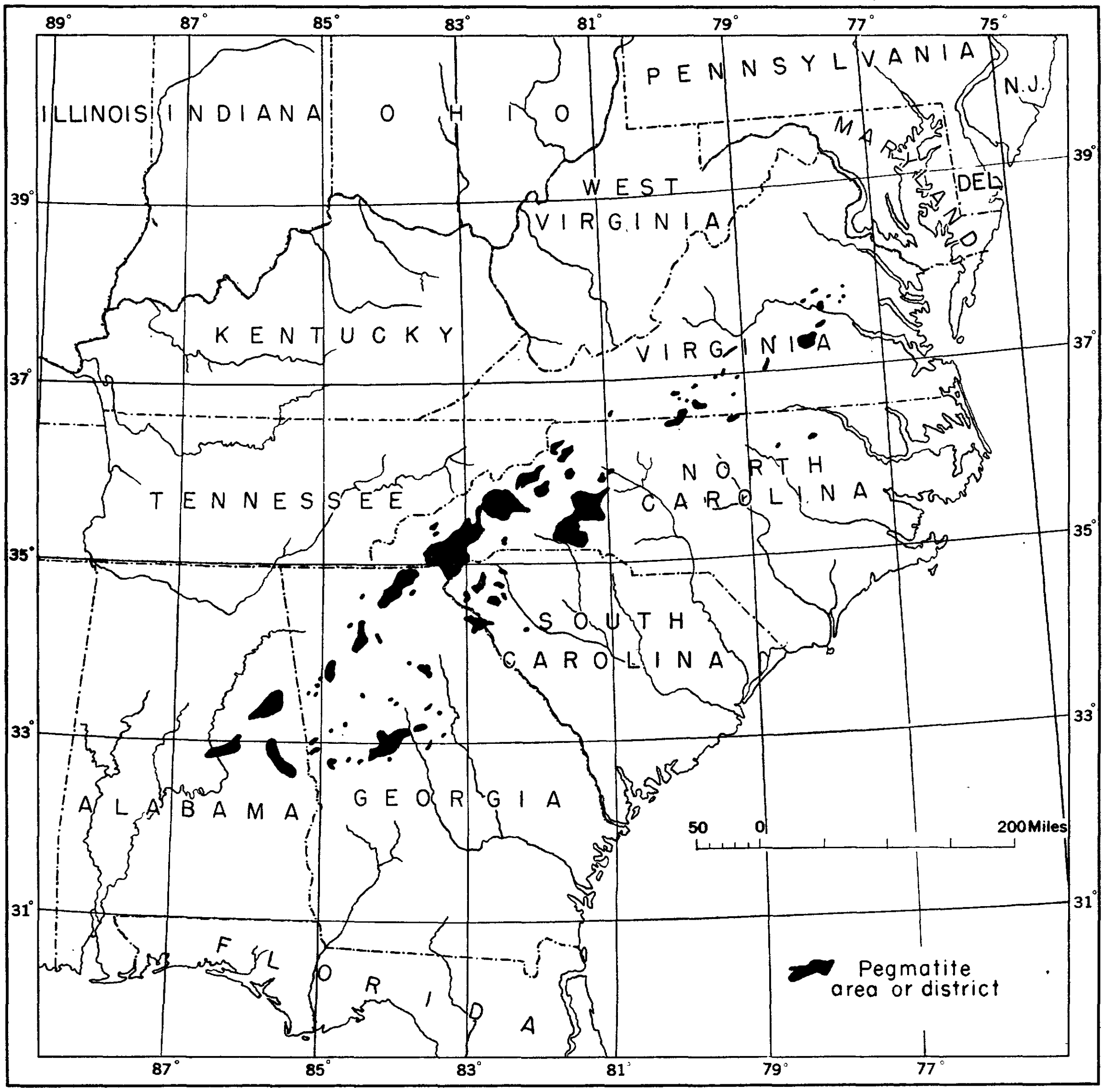


FIGURE 15.—Distribution of principal pegmatite areas and districts in the southeastern United States.

HISTORY AND PRODUCTION

The pegmatites of the Southeastern States have yielded large quantities of sheet and scrap mica, feldspar, quartz, and kaolin, as well as some beryl, cassiterite, garnet, monazite, specimen material, spodumene, tantalum-columbium minerals, topaz, uranium minerals, vermiculite, and zircon. Feldspar has been an important byproduct of some of the mica mining, and much mica has been produced as a result of widespread operations for feldspar and kaolin. Many of the minor minerals have been produced solely as byproducts.

Mining operations for sheet mica date back at least to the fourteenth century, and the remnants of many ancient trenches, pits, and cuts are recorded from several districts.[49] Evidently these were made by Indians, who probably used the mica for ornamental purposes. Their work was confined to the soft, kaolinized parts of the deposits, but a little of the mining was done underground. Modern mining was

[49] Kerr, W. C., The mica veins of North Carolina: Am. Inst. Min. Eng. Trans., vol. 8, pp. 457-462, 1880; Phillips, W. B., Mica mining in North Carolina: Eng. and Min. Jour., vol. 45, pp. 286, 306-307, 322, 324, 382-383, 398, 418, 436, 1888; Smith, C. D., Ancient mica mine in North Carolina: Smithsonian Inst. Rept., pp. 441-443, 1876; Sterrett, D. B., Mica deposits of the United States: U. S. Geol. Survey Bull. 740, pp. 28, 167, 224-225, 1923.

started shortly after the Civil War, chiefly in the Virginia Piedmont and in the Shelby-Hickory, Spruce Pine, and Franklin-Sylva districts of North Carolina. Many mines were opened after 1875, and large quantities of stove mica were produced from 1885 to 1900.

Increasing demands from the electrical industry stimulated later production, especially after 1910, and the favorable price schedules of World War I brought mining and prospecting activities to the highest levels known up to that time. A severe but brief postwar slump was followed by a 9-year period of prosperity in the industry, during which the average annual production of sheet and punch mica in the Southeastern States was about 760,000 pounds. The output fell sharply in 1931 and 1932 but later slowly rose until it reached the million-pound-per-year level. The unprecedented demands during World War II led to even greater production, and in 1943 a total of 2,132,826 pounds of sheet and punch mica was obtained. This figure is all the more remarkable, as compared with previous records, when the superior degree of preparation of the recent output is taken into account. Much mica that would ordinarily have been sold as half-trim or punch was prepared as large full- and three-quarter-trimmed sheets and as small full-trimmed sheets; hence bulk was materially reduced.

TABLE 7.—*Summary data on the number of mica deposits in the southeastern United States*

District or area	Number of deposits yielding strategic mica during World War II	Number of deposits studied in detail by Survey during 1939–46	Estimated minimum number of mines and prospects
Jefferson-Boone	28	12	80
Wilkes	22	7	50
Spruce Pine	708	594	2,000
Buncombe	47	21	80
Franklin-Sylva	411	433	900
Outlying North Carolina Blue Ridge	19	7	150
North Georgia	14	3	80
Amelia	13	83	120
Ridgeway-Sandy Ridge	34	30	80
Outlying Virginia	24	29	200
Shelby-Hickory	253	168	350
Outlying North Carolina Piedmont	37	6	100
Outlying South Carolina	27	13	60
Hartwell	76	33	150
Thomaston-Barnesville	59	69	150
Outlying Georgia	34	11	170
Alabama	41	126	250
Total	1,847	1,645	4,970

The yearly production of sheet and punch mica from North Carolina, from the Southeastern States, and from the entire United States during the period 1912-44 is shown in table 8. Nearly 97 percent of the Southeastern production has been derived from deposits in North Carolina, and this mica represents about 95 percent of the total value. Most of the remaining 3 percent of the production has been obtained from Georgia and Virginia. Through the same period the Southeastern States have accounted for 25,028,404 pounds, or about 54 percent of the total United States production, of sheet and punch mica, and its value of $9,720,273 has amounted to 62 percent of the total. In general these proportions have been rising slightly during recent years. The average value of the output from the Southeastern States has been about 39 cents per pound. In contrast, it was 50 cents per pound during the wartime period 1917-19 and 89 cents per pound during the period 1942-44.

TABLE 8.—*Production of sheet and punch mica, 1912-44, in North Carolina, the Southeastern States, and the entire United States*

[Based on data from U. S. Geological Survey and U. S. Bureau of Mines, Mineral Resources of the United States and Minerals Yearbook, 1912-44]

Year	North Carolina		Southeastern States (Va., N. C., S. C., Ga., and Ala.)		United States (all)	
	Amount (pounds)	Value (dollars)	Amount (pounds)	Value (dollars)	Amount (pounds)	Value (dollars)
1912	489,599	219,874	(1)	(1)	845,483	282,823
1913	803,462	230,674	(1)	(1)	1,700,677	353,715
1914	274,121	171,370	308,121	175,704	556,933	278,540
1915	281,074	266,650	294,376	272,830	553,821	378,259
1916	546,553	380,700	616,700	406,000	865,863	524,485
1917	643,476	543,207	761,044	581,707	1,276,533	753,874
1918	941,200	460,450	1,239,700	587,100	1,644,200	731,810
1919	1,021,306	331,498	1,092,152	385,312	1,545,709	483,567
1920	1,084,946	405,654	1,395,838	461,936	1,683,480	546,972
1921	230,532	51,851	250,084	55,245	741,845	118,513
1922	544,495	119,767	598,321	130,601	1,077,968	194,301
1923	1,130,283	188,317	1,194,628	194,652	2,063,179	311,180
1924	597,385	108,656	682,961	116,475	1,460,897	212,035
1925	592,478	105,376	622,421	111,328	1,793,865	321,962
1926	700,313	150,362	742,345	157,576	2,172,159	400,184
1927	665,360	114,514	713,554	127,755	1,512,492	212,482
1928	777,395	129,706	804,457	133,492	1,681,777	230,956
1929	894,200	150,293	936,524	155,649	2,035,128	286,321
1930	749,074	112,451	776,075	117,573	1,465,485	177,307
1931	389,426	51,657	405,234	53,475	962,953	111,830
1932	127,696	18,322	139,863	19,554	338,997	45,882
1933	162,672	21,107	162,731	21,113	364,540	53,179
1934	293,381	38,671	295,994	38,788	583,528	90,268
1935	512,590	77,598	517,157	78,052	936,633	191,150
1936	730,446	119,653	783,768	124,115	1,319,233	203,879
1937	1,044,328	218,176	1,057,320	219,247	1,694,538	285,244
1938	632,646	87,879	655,866	89,706	939,507	139,333
1939	401,170	69,344	419,210	71,317	813,708	138,963
1940	1,002,646	218,154	1,046,535	223,817	1,625,437	291,685
1941 [2]	1,614,863	318,783	1,707,488	332,050	2,666,453	566,858
1942 [2]	1,654,895	505,634	1,783,646	555,475	2,761,844	725,030
1943 [2]	1,901,120	1,772,324	2,132,826	2,007,583	3,448,199	3,228,742
1944 [2]	814,874	1,530,625	891,465	1,715,046	1,523,313	3,262,711
Total	24,250,005	9,286,297	25,028,404	9,720,273	46,656,377	16,134,040

[1] No complete data available.
[2] Includes splittings.

OCCURRENCE

GENERAL GEOLOGIC FEATURES

Most of the mica-bearing pegmatites occur in metamorphic rocks, chiefly mica schist and gneiss, impure quartzite, and hornblende schist and gneiss, with minor interlayered kyanite gneiss, sillimanite gneiss, graphitic schist, recrystallized limestone and dolomite, and various types of chloritic rocks. The foliated micaceous rocks have been included in the Wissahickon schist of Virginia, the Carolina gneiss of Virginia, Georgia, and the Carolinas, and the Ashland mica schist of Alabama. They form the bulk of the country rock in most of the pegmatite districts. The hornblendic rocks, which generally are interlayered with the micaceous types, have been grouped with the Roan gneiss in Georgia and the Carolinas and have been termed metagabbro in parts of Virginia. They are abundant in the Jefferson-Boone, Spruce Pine, Franklin-Sylva, Shelby-Hickory, and

Ridgeway-Sandy Ridge districts but are not common, for example, in the Amelia, Hartwell, and Alabama districts. In general these hornblendic rocks appear to be metamorphosed sills, dikes, and flows of intermediate and basic composition; probably they are appreciably younger than the micaceous schists and gneisses. Both rock types may be pre-Cambrian in age.

Large masses of silicic intrusive rocks, probably late Paleozoic in age, are exposed in many districts. They are fine to very coarse grained and range in composition from quartz monzonite to quartz diorite. Some, like those in the Spruce Pine district, are pegmatitic in texture and are so leucocratic that they have been termed alaskite.[50] Others contain more biotite or other mafic minerals and have a typical "salt-and-pepper" texture. Associated with most of these intrusive masses are finer-grained satellitic sills and dikes, as well as many types of hybrid or migmatitic rocks.

Most of the commercial mica-bearing pegmatites occur in metamorphic rocks. In general they are similar in composition to nearby intrusive masses and in some districts are demonstrably related to them. Some pegmatites in Spruce Pine and other districts occur within, rather than adjacent to, stocks and large sill-like bodies of quartz diorite and granodiorite, but these are in the minority and account for only a small proportion of the mica produced from these districts. Many geologic features of mica-bearing pegmatites in the Southeastern States have been described by Sterrett.[51] Those in Virginia are discussed by Pegau,[52] C. B. Brown,[53] and W. R. Brown;[54] those in North Carolina by Sterrett,[55] Maurice,[56] Kesler and Olson,[57] and Olson;[58] those in Georgia by Galpin[59] and by Furcron and Teague;[60] and those in Alabama by Clark.[61] General geologic information concerning the pegmatite districts is available in the maps and reports of Stose,[62] Stose, Jonas and others,[63] Keith,[64] La Forge and Phalen,[65] Stose and Smith,[66] Keith and Sterrett,[67] and others. In addition the literature contains many papers and reports of less general scope or less immediate application. They are referred to in this report in specific connections only.

PEGMATITES

The pegmatites of the Southeastern States consist chiefly of plagioclase and quartz, with subordinate perthite, muscovite, and biotite and accessory garnet, apatite, beryl, columbium-tantalum minerals, uranium minerals, sulfides, and other species. They are granodioritic rather than truly granitic in composition. Muscovite is present in some deposits as disseminated flakes, foils, and tiny books, but in others it occurs as very large books, some of which are 2 feet or more in diameter and weigh several hundred pounds or more. All variations between these extremes are known, and many pegmatites contain book muscovite in a wide variety of sizes and forms. In general the distribution of mica within a given deposit reflects the shape of the containing pegmatite body, but there appears to be little correlation between the size of the body and the quantity of mica that it contains.

Both concordant and discordant pegmatites are common. Dikes, sills, discoidal lenses, pods, tongues, and cigar-shaped bodies are most widespread, and archlike or troughlike bodies and more irregular masses are locally abundant. The bodies range from lenses and stringers less than an inch thick to dikes and sill-like masses several hundred feet long and 200 feet or more thick. The emplacement of these pegmatites appears to have been controlled by primary layering and other planar structures in the igneous rocks, by bedding, foliation, and schistosity in metamorphic rocks, and to a considerable degree by fractures in both rock types. Numerous pegmatite masses, especially those that are highly irregular, probably owe their form to combinations of these features. The orientation of many pegmatites—and of minor structures within them—can be correlated

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[62] Stose, G. W., Geologic map of Alabama, Alabama Geol. Survey and U. S. Geol. Survey, 1926.

[63] Stose, G. W., Jonas, A. I., and others, Geologic map of Virginia, Virginia Geol. Survey and U. S. Geol. Survey, 1928.

[64] Keith, Arthur, U. S. Geol. Survey Geol. Atlas, Cranberry folio (no. 90), 1903; Asheville folio (no. 116), 1904; Mount Mitchell folio (no. 124), 1905; Cowee folio (unpublished manuscript), 1906; Nantahala folio (no. 143), 1907; Pisgah folio (no. 147), 1907; Roan Mountain folio (no. 151), 1907; Lincolnton folio (unpublished manuscript), 1911.

[65] La Forge, Laurence, and Phalen, W. C., U. S. Geol. Survey Geol. Atlas, Ellijay folio (no. 187), 1913.

[66] Stose, G. W., and Smith, R. W., Geologic map of Georgia, Georgia Div. Mines, Mining and Geol. and U. S. Geol. Survey, 1939.

[67] Keith, Arthur, and Sterrett, D. B., U. S. Geol. Survey Geol. Atlas, Gaffney-Kings Mountain folio (no. 222), 1931.

with the orientation of major and minor structures in the adjacent country rock.

A general systematic arrangement of mineralogic and lithologic units in many pegmatites has long been recognized, and references to "shoots," "ribs," "pipes," "barrels," "columns," "veins," "zones," "pods," "streaks," and "layers" are common among miners and in geologic literature. Recent detailed examination and mapping of pegmatites in many parts of the United States have fully confirmed these earlier observations and have added abundant detail and new information as well. As suggested by members of the United States Geological Survey,[68] the units of pegmatites can be divided into three groups: zones, fracture fillings, and replacement bodies.

Zones, where fully developed, are successive shells concentric about an innermost zone or core. In a general way they reflect the shape of the pegmatite body. Where incomplete or discontinuous they commonly form curving lenses, layers, pods, and hoodlike shells. Fracture fillings are bodies that fill fractures in previously consolidated pegmatite; generally they are distinctly tabular. Replacement bodies are units formed by replacement of preexisting pegmatite, with or without obvious structural control, and are not to be confused with the relatively simple pegmatite formed by replacement of country rock. They generally occur along boundaries between zones, between zones and fracture fillings, between pegmatite and wall rock, or along any other structural element within the pegmatite. Both fracture fillings and replacement bodies form structural patterns that are superimposed on the concentric or quasi concentric patterns of the earlier-formed zones; hence a division of pegmatite units into two general age groups is easily made. Such a broad division is perhaps in part compatible with the findings and conclusions of Schaller,[69] Landes,[70] Hess,[71] and many other students of pegmatite geology, although markedly differing interpretations of these age groups have been advanced from time to time.

The following classification of pegmatite zones has been proposed:[72]

1. Border, or outermost, zones.
2. Wall zones.
3. Intermediate zones.
4. Cores, or innermost zones.

[68] Cameron, E. N., Jahns, R. H., McNair, A. H., and Page, L. R., The internal structure of granitic pegmatites: Econ. Geol., Econ. Mon. 2, pp. 13–16, 1949.

[69] Schaller, W. T., The genesis of lithium pegmatites: Am. Jour. Sci., 5th ser., vol. 10, pp. 269–279, 1925.

[70] Landes, K. K., The paragenesis of the granite pegmatites of central Maine: Am. Mineralogist, vol. 10, pp. 355–411, 1925.

[71] Hess, F. L., The natural history of the pegmatites: Eng. and Min. Jour., vol. 120, pp. 289–298, 1925.

[72] Cameron, E. N., Jahns, R. H., McNair, A. H., and Page, L. R., The internal structure of granitic pegmatites: Econ. Geol., Econ. Mon. 2, pp. 20–24, 1949.

The idealized diagram in figure 16 shows the distribution of zones and later units in a typical mica-bearing pegmatite body.

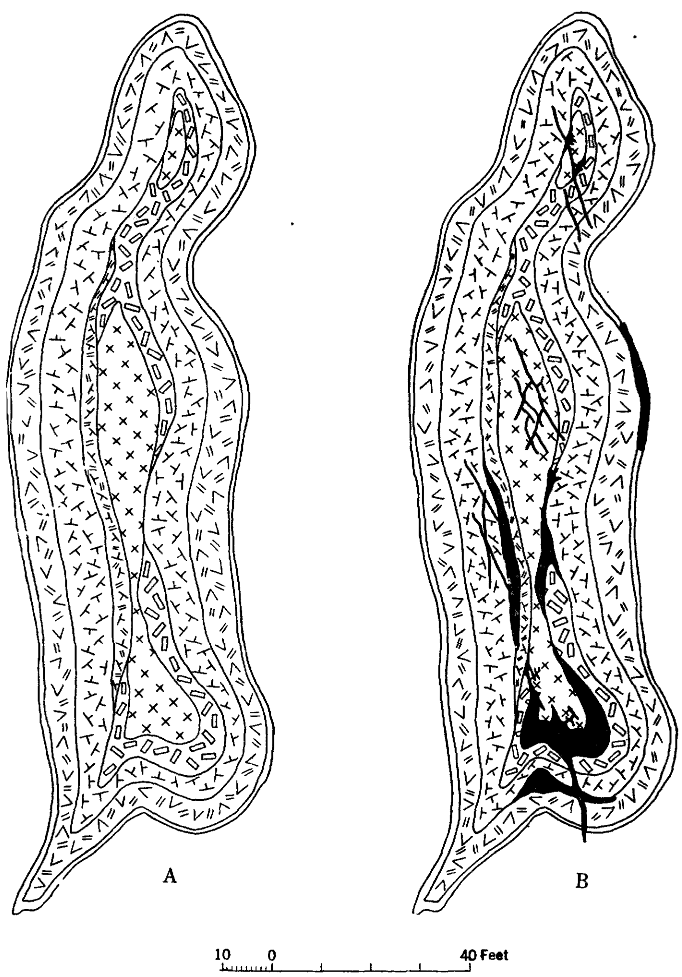

FIGURE 16.—Idealized plans of a pegmatite body, showing typical distribution of pegmatite units. *A*, Zones, comprising a core of massive quartz surrounded successively by an inner intermediate zone of coarse, blocky perthite, a middle intermediate zone of perthite-plagioclase-quartz-muscovite pegmatite, an outer intermediate zone of perthite-plagioclase-quartz pegmatite, a wall zone of plagioclase-quartz-muscovite pegmatite, and a border zone of fine-grained plagioclase-quartz-muscovite pegmatite; *B*, Same zones, with fracture fillings and replacement bodies of albite-muscovite pegmatite (solid black) formed in them or at their expense.

Most border zones are fine-grained selvages that are not more than a few inches thick. Others, particularly those that have formed wholly or in part through replacement of country rock, are much thicker, more irregular, and not sharply defined. Wall zones, which are next inside the border zones, are characteristically coarser and much thicker. Although they are actually the zones second from the margins of pegmatite bodies, the designation "wall zone" has been retained in recognition of a terminology firmly established among pegmatite miners and mine operators. Most border zones are of little significance in the mining of pegmatites; hence in the industry they have not been distinguished from adjoining zones. As border zones rarely are economic or mappable units, the term "wall zone," though strictly a misnomer, is nevertheless useful and widely understood.

The core, or innermost zone, generally occurs at or near the center of the pegmatite body. Any zone between the core and the wall zone is an intermediate zone. There is no theoretical limit to the number of intermediate zones in a single pegmatite body, but few contain more than three such units. The innermost zone of a pegmatite cannot always be recognized as such, for not every core can be seen or even predicted with reasonable assurance. Thus a zone identified as a core at one level may prove to be an intermediate zone when the top or edge of the true lenslike core is exposed by subsequent mining.[73] The cores, and possibly other zones as well, are not exposed in many pegmatites that have been only slightly cut by erosion.

Numerous pegmatite bodies contain one or more podlike concentrations of minerals. These pods generally can be recognized as segments of discontinuous cores where they are clearly distributed midway between the walls of the pegmatites, but elsewhere their distribution is not so easily interpreted. In most deposits, however, they can be considered as parts of discontinuous zones.

The zones in most pegmatite bodies coarsen progressively inward from the walls. Moreover, many zones are transected by offshoots or apophyses from other zones that lie nearer the center of the pegmatite, but the reverse relation has not been observed. On the basis of widespread observation it seems clear that zones in the mica-bearing pegmatites of the Southeastern States were developed successively from the walls inward. The internal structure of many pegmatites in New England has been described in detail by Cameron and others.[74] Pegmatites in western North Carolina have been reported on by Olson [75] and those in northern New Mexico by Jahns.[76] In addition, other reports on mica deposits in Idaho, South Dakota, Colorado, Wyoming, and the Southeastern States are currently in preparation by members of the United States Geological Survey.

MICA DEPOSITS

Some deposits of book muscovite in the Southeastern States occur in pegmatites that are not clearly zoned, but most are in well-defined units that in general are quite distinct from adjacent barren units, and their distribution is clearly governed by zonal structures. Entire zones in some pegmatites are sufficiently rich in mica to be mined, but most deposits of commercial interest are confined to certain portions of zones and hence occur as shoots not unlike the shoots of ore minerals in metalliferous deposits. The position and distribution of such shoots commonly can be correlated with the over-all shape of the containing zone or with rolls, bends, bulges, constrictions, protuberances, or other irregularities in the zone. Little salable material is associated with fracture fillings or replacement bodies, particularly in the pegmatites yielding the greatest production. Such late-stage mica is common only in a few pegmatites in the Amelia district of Virginia and in some larger, feldspar-rich, pegmatites in other districts.

The classification of zones provides a ready means of naming many mica deposits. Such designations as "wall-zone deposit," "intermediate-zone deposit," "footwall deposit," "pod deposit," or "core-margin deposit" require a minimum of explanation. If two or more intermediate zones are present, they can be distinguished by means of letters, numbers, or such position modifiers as "outer," "inner," "lower," and the like.

Wall-zone deposits yield most of the sheet muscovite produced in the Southeastern States. Substantial quantities also are obtained from disseminated deposits in poorly zoned pegmatites and from core-margin or other intermediate-zone concentrations. Detailed field studies have demonstrated that the mica within a given zone is rather constant in color, clearness, type and distribution of structural defects, and other physical properties, whereas the books from different zones within the same pegmatite commonly differ very strikingly. Green "A" mica, for example, is especially abundant along the edges of quartz cores in many pegmatites, whereas the mica in the earlier-formed wall zones of the same pegmatites is cinnamon brown, brown, or brownish olive and is relatively free from reeves. Strongly reeved mica is most abundant in the pegmatites and pegmatite zones that are rich in potash feldspar, and it is later than the flat mica in those pegmatites that contain both kinds of books. Systematic variations in other properties are discussed in the following section of this report.

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[73] Bannerman, H. M., and Cameron, E. N., The New England mica industry: Am. Inst. Min. Met. Eng. Tech. Pub. 2024, 1946; Jahns, R. H., Strategic pegmatite minerals from the Southwestern and Southeastern States during World War II: Am. Inst. Min. Met. Eng. Tech. Pub. (in press, 1949); Cameron, E. N., Jahns, R. H., McNair, A. H., and Page, L. R., The internal structure of granitic pegmatites: Econ. Geol., Econ. Mon. 2, pp. 21–24, 1949.

[74] Cameron, E. N., Larrabee, D. M., McNair, A. H., Page, J. J., Shainin, V. E., and Stewart, G. W., Structural and economic characteristics of New England mica deposits: Econ. Geology, vol. 40, pp. 369–393, 1945.

[75] Olson, J. C., Economic geology of the Spruce Pine pegmatite district, N. C.: North Carolina Dept. Cons. and Devel., Div. Min. Resources, Bull. 43, 1944; Mica deposits of the Franklin-Sylva district, N. C.: North Carolina Dept. Cons. and Devel., Div. Min. Resources, Bull. 49, 1946.

[76] Jahns, R. H., Mica deposits of the Petaca district, Rio Arriba County, N. Mex.: New Mexico School of Mines, State Bur. Mines and Min. Resources, Bull. 25, 1946; Strategic pegmatite minerals from the Southwestern and Southeastern States during World War II: Am. Inst. Min. Met. Eng. Tech. Pub. (in press, 1949).

TESTS OF SHEET MUSCOVITE FROM THE SOUTHEASTERN STATES

GENERAL STATEMENT

Electrical tests of sheet mica from numerous specific deposits in the southeastern United States were first made in 1940 and 1941, when material collected from 124 mines by the Federal Geological Survey was studied by the National Bureau of Standards.[77] As previously pointed out, several of these samples were subsequently treated in greater detail by two large fabricators of electrical equipment. More extensive investigations, later made by the War Production Board in Asheville, N. C., involved the testing of several thousand pieces of block mica supplied by the Colonial Mica Corporation. This material represented most of the Southeastern mines operated in 1942 and 1943. It was graded and classified visually and by means of the Q-meter and spark-coil test set, but the results of this work have not yet been published.

The studies described in this report were made under the joint auspices of the Geological Survey, the State of North Carolina, and the Tennessee Valley Authority during the period July 1945–April 1946. A total of 2,502 lots containing 237,764 pieces of mica was examined petrographically and tested electrically. This material, obtained from at least 850 deposits in the states of Alabama, Georgia, North Carolina, South Carolina, and Virginia, was broadly classified as follows:

839 lots: Material previously collected, labeled, and stored by the Geological Survey.
474 lots: Special material collected by the Geological Survey, including large lots of mica from the Southeastern States and some mica from New England, South Dakota, and New Mexico.
493 lots: Material collected by the Geological Survey and the State of North Carolina during the period of the mica-testing program.
243 lots: Stored material loaned by the Colonial Mica Corporation and previously graded by visual means.
41 lots: New material prepared and graded by visual means and loaned by the Colonial Mica Corporation.
78 lots: Heavily stained electric mica, prepared and loaned by H. A. Knight of High Point, N. C.
334 lots: Miscellaneous material furnished or loaned by mine operators, manufacturers, and various organizations.

The lots furnished by the Geological Survey comprised raw mica obtained from mines, mine dumps and waste piles, and rifting shops, as well as some prepared stock from shops and storage sheds. Most of this mica was specifically identified as to source, and in many instances its position within a given mine and with respect to the walls, crest, or keel of the containing pegmatite was known.

All raw mica was cobbed free of quartz, feldspar, and other waste when necessary and was then rifted and trimmed before testing. Trimming was done by means of small, hand-operated, sickle-bladed knives, with formation of beveled edges on the finished material. Most sheets were full-trimmed, whether or not they were marred by reeves, ribs, clay stains, or mineral stains, and many of them could be classified visually as little better than scrap grade. Some samples consisted of such poor material that they were rifted but not trimmed, thereby yielding pieces that were loosely classed as "washer stock." Others, however, contained clear sheets of apparently excellent quality. During preparation of the mica considerable quantities of very thin laminae or "skimmings" were produced. These were later stacked to thicknesses of 30 mils (0.030 inch), and the stacks were tested for power factor and conducting impurities.

Mines and prospects from which test specimens were obtained are:

Alabama:
- Clay County:
  - M and G mine.
- Randolph County:
  - Arnott mine.
- Tallapoosa County:
  - Berry mine.
  - Collum (McCray) mine.
  - Collum "Quartz-Blowout" deposit.
  - Kidd mine.
  - McCray. *See* Collum mine.
  - Mica Hill mine.

Georgia:
- Elbert County:
  - Cooley mine.
  - Crawford-Daniel mine.
  - Gaines, C. U., prospect.
  - Gaines, M. L., mine.
  - New Bethel M. E. Church prospect.
  - Skelton, J. M., prospect.
  - Turner prospect.
- Hall County:
  - Merck (Old Hope) mine.
  - Old Hope. *See* Merck mine.
- Hart County:
  - Allen, Lon. *See* Wood mine.
  - Bailey mine.
  - Carter mine.
  - Garner mine.
  - Gully. *See* Wood mine.
  - Harper-Pierman mine.
  - Horsehead mine.
  - Jones, Ruth, mine.
  - Scrap mine.
  - Waterhole mine.
  - Wood (Gully, Lon Allen) mine.

[77] Kesler, T. L., and Olson, J. C., Muscovite in the Spruce Pine district, N. C.: U. S. Geol. Survey Bull. 936-A, pp. 18–30, 1942.

Georgia—Continued
  Lamar County:
    Coggins prospect.
    Vaughn, Early, mine.
  Monroe County:
    Battles mine.
  Rabun County:
    Kell mine.
    Norton mine.
    Tunnel mine.
  Troup County:
    Hogg mine.
    Smith Store prospect.
  Upson County:
    Adams mine.
    Barron (Bennie Barron, Walker Wakefield) mine.
    Barron, Bennie. *See* Barron mine.
    Boyt mine.
    Brown (Parrish) mine.
    Carter mine.
    Corley mine.
    Gibson, B. S., prospects.
    Herron mine.
    Johnson mine.
    Marshall. *See* Stevens Rock mine.
    Mauldin mine.
    Mauldin Road prospect.
    McKinney. *See* Stevens Rock mine.
    Mitchell Creek mine.
    Parrish. *See* Brown mine.
    Stevens Rock (Marshall, Sullivan, McKinney) mine.
    Sullivan. *See* Stevens Rock mine.
    Wakefield, Walker. *See* Barron mine.
North Carolina:
  Alexander County:
    Dagenhart mine.
    Gwaltney prospect.
    Patterson mine.
  Ashe County:
    Buck Mountain mine.
    Hodson prospect.
  Avery County:
    "A" mine (on Brushy Creek).
    "A" mine (on Little Elk Ridge).
    Aldrich mine.
    Alfred mine.
    Benfield mine.
    Benfield, Byard, mine.
    Big Meadow. *See* Moulton mine.
    Bluff mine.
    Branch mine.
    Brushy Creek East mine.
    Buchanan, Aaron, mine.
    Buchanan, Franklin, (Lee Cook) mine.
    Buck Hill Rock mine.
    Bug Rock (Westphalen) mine.
    Burleson, Charley, mine.
    Carpenter, Tom, mine.
    Charlies Ridge mine.
    Comina, Jose. *See* Vance, Freel, mine.
    Cook, Lee. *See* Buchanan, Franklin, mine.
    Corn mine.
    Cow Camp South mine.
    Doublehead mine.
    Dugger mine.
    Eli Rock mine.

North Carolina—Continued
  Avery County—Continued
    Elk (Milton English) mine.
    Emmons Knob mine.
    English, Milton. *See* Elk mine.
    Ewing mine.
    Four Foot Square mine.
    Franklin mine.
    Green, Ruben, mine.
    Gusher Knob mine.
    Hoppey mine.
    Houston Rock mine.
    Johnson mine (on Plumtree Creek).
    Johnson, I. M., mine.
    Justice mine.
    Lincoln Rock mine.
    Lincoln Rock No. 2 mine.
    Madam Bank mine.
    Meadow mine.
    Mill Race mine.
    Moulton (Big Meadow) mine.
    Old Rock mine.
    Ollis, Jake, mine.
    Pancake mine.
    Plumtree (Race) mine.
    Powdermill Rough mine.
    Pyatte, Zeb, mine.
    Race. *See* Plumtree mine.
    Red mine.
    Red prospect.
    Slippery Elm mine.
    Taylor, Fate, mine.
    Vance, Freel, (Jose Comina) mine.
    Westphalen. *See* Bug Rock mine.
    White Rock mine.
    Wiseman, Honey Waits, mine.
    Wolf Ridge mine.
  Buncombe County:
    Abernathy Watershed. *See* New Balsam Gap mine.
    Burco mine.
    Corner Rock mine.
    Mitzes mine.
    New Balsam Gap (Abernathy Watershed) mine.
    Smith, Beede. *See* Swannanoa mine.
    Swannanoa (Beede Smith) mine.
    Tipton mine.
  Burke County:
    Brittan, Floyd, mine.
    Hudson prospect.
    Reed mine.
    Young, Noah, mine.
  Caldwell County:
    Butler mine.
    Daniels, Cling, mine.
  Caswell County:
    Old Milton. *See* Yarboro No. 1 mine.
    Slaughter, J. G., prospect.
    Yarboro No. 1 (Old Milton) mine.
  Catawba County:
    Abernathy Long Cut (Hickory) mine.
    Abernathy Water mine.
    Drum mine.
    Hickory. *See* Abernathy Long Cut mine.
    Moose mine.
    Sigmon mine.
    Tallant prospect.

North Carolina—Continued
Cleveland County:
Anthony prospects.
Archie mine.
Big Hill. *See* Bonnett Split mine.
Blanton prospect.
Blanton, C. Robert, mine.
Blanton, Cliff, mine.
Blanton, Coleman, mine.
Bonnett Split (Big Hill) mine.
Bowen mine.
Bridges, Pleaz, mine.
Bumgarner mine.
Cabaniss prospect.
Cabaniss, Alma, mine.
Cabaniss, Tom, mine.
Campbell mine.
Carpenter mine.
Chrysolite mine.
Cooke mine.
Cornwall, Frank, (Old J. S. Blanton) mine.
Cornwell, Charles, prospect.
Davis, Walter, mine.
Elliot, L. R., mine.
Fortenberry, W. H., prospect.
Foster, J. L., prospect.
Gantt, B. T., prospect.
Gantt, M. H., mine.
Gettys No. 1 mine.
Gettys No. 2 mine.
Glover, Eli, mine.
Gold, Mary, mine.
Green, J. F., mine.
Griggs mine.
Harris mine.
Herndon mine.
Homestead. *See* Mauney, S. S., mine.
Hoyle, A. F., mine.
Humphries, Joe E., mine.
Humphries, W. H., prospect.
Hunt mine.
Indian Graveyard mine.
Indiantown (Mull) mine.
Jimmy mine.
Jones mine.
King, Marvin, prospects.
Lail prospect.
Lattimore mine.
Ledford mine.
Martin mine.
Martin, J. T., prospect.
Mauney, Bailey, mine.
Mauney, M. M. *See* Mauney, S. S., mine.
Mauney, S. S., (M. M. Mauney, Homestead) mine.
McGinnis, F. G., mine.
McSwain, G. B., mine.
Metcalf mine.
Mill Race mine.
Moose mine.
Mull. *See* Indiantown mine.
Niagara mine.
Norman, Archie, (W. H. Thompson) mines.
Norman-Thompson (W. H. Thompson) mine.
Old Carroll. *See* Patterson, Bun, mine.
Old J. S. Blanton. *See* Cornwall, Frank, mine.
Patterson, Bun, (Old Carroll) mine.
Peeler No. 1 mine.

North Carolina—Continued
Cleveland County—Continued
Powell (Sugar Barrel) mine.
Putnam mines.
Randall mine.
Rice mine.
Scism prospect.
Spangler, D. H., prospects.
Spangler, Ruben. *See* Spangler, T. N., prospects.
Spangler, T. N., (Ruben Spangler) prospects.
Stroud, T. C., prospects.
Sugar Barrel. *See* Powell mine.
Thompson, W. H. *See* Norman, Archie, mines.
Thompson, W. H. *See* Norman-Thompson mine.
Warlick, Clyde, mine.
Weathers mine.
Webb mine.
Williamson mine.
Wright prospect.
Gaston County:
Beam, Claude, prospect.
Big Bess mine.
Huskins mine.
Old Neale. *See* Self, E. R., mine.
Self, E. R., (Old Neale) mine.
Haywood County:
Arrowood. *See* Little East Fork mine.
Big Ridge mine.
Champion Fibre Co. prospect.
Gray. *See* Putman mine.
Little East Fork (Arrowood) mine.
Medford, Frank, prospect.
Putman (Gray) mine.
Shiney mine.
Spruce Ridge mine.
Stringfield mine.
Wilson, W. T., prospect.
Jackson County:
Abbs Creek mine.
Ashe, Bob, mine.
Bald Ridge mine.
Bearwallow Fork. *See* Piney Mountain Creek mine.
Betts Gap mine.
Bettys Creek No. 1 mine.
Big East Fork mine.
Big Flint (Grassy Ridge, Glassey Rock) mine.
Big Terrapin mine.
Blackjack mine.
Blanton prospect.
Brown's Coward Mountain. *See* Wood mine.
Bryson mine.
Bryson, C. D., mine.
Bryson, C. V., mine.
Bryson, Diller, mine.
Buchanan, B. C., prospects.
Buchanan, Henry, prospects.
Buchanan, Marsden, prospect.
Buchanan, Pole, mine.
Buchanan, Ramsey, mine.
Buchanan's Old. *See* Gradin mine.
Buckeye Gap mine.
Buck Knob mine.
Bumgarner mine.
Buzzard Roost mine.
"C" (Puncheon Camp) mine.
Cabe mine.
Cedar Cliff mine.

North Carolina—Continued
Macon County—Continued
Angel, George, (Cabe, Moore) mine.
Angel, Mel, mine.
Annie Laurie (Wade Moody) mine.
Arnold, Fred, prospect.
Arrowwood mine.
Bailey mine.
Baird (Smith) mines.
Barnard. *See* Burke, John, mine.
Bearpen mine.
Beasley No. 1 (Bradley Butt) mine.
Beasley No. 2 mine.
Berry. *See* Deerlick Knob mine.
Berry mine.
Boyd Knob. *See* Shepherd Knob mine.
Bradley Butt. *See* Beasley No. 1 mine.
Bradley-Campbell (Campbell, Higdon) mine.
Brawley mine.
Bryson. *See* Burr Knob mine.
Bryson prospect.
Bryson, Terrell, (Old Bryson) mine.
Buoy No. 1 mine.
Buoy No. 2 mine.
Burke, John, (Barnard) mine.
Burleson, John, mine.
Burningtown. *See* Poll Miller mine.
Burr Knob (Bryson) mine.
Buttermilk mine.
Cabe. *See* Angel, George, mine.
Camp Branch prospect.
Campbell. *See* Bradley-Campbell mine.
Chalk Hill mine.
Corbin Knob mine.
Corbin Knob prospects.
Crawford, Lester, prospect.
Cunningham mine.
Dalton mine.
Deerlick Knob (Berry) mine.
Dills mine.
Dobson mine.
Downs, Charlie, prospect.
Duvall, Grady. *See* Raby mine.
Elmore mine.
Elmore Branch prospect.
Evans, A. J., prospect.
Fox mine.
Gibson mine.
Gibson prospect.
Gum Gap mine.
Gurney mine.
Hall prospect.
Hall-Burra mine.
Harris mine.
Henry. *See* Ammons mine.
Henry, Jacob W. *See* Henry, Jake, mine.
Henry, Jake, (Jacob W. Henry, Rocky Face) mine.
Higdon. *See* Bradley-Campbell mine.
Higdon prospect.
Holbrook. *See* Kasson mine.
Iotla. *See* Iotla-Bradley mine.
Iotla-Bradley (Iotla, Iotla Bridge) mine.
Iotla Bridge. *See* Iotla-Bradley mine.
Jack Knob mine.
Kasson (Holbrook) mine.
Kelly, Lassie, (Pine Knob) mine.
Kinsland prospect.

North Carolina—Continued
Macon County—Continued
Kiser mine.
Leatherman, S. C., prospect.
Ledford Cove mine.
Lenoir prospect.
Lin Cove prospect.
Little Spring mine.
Littlefield mine.
Locust Tree prospect.
Lower Mack mine.
Lucas, Doc, mine.
Lyle, Doc, mine.
Lyle Cut mine.
Lyle Knob mine.
Malonee mine.
Mashburn, Norman. *See* Roaring Fork mine.
Mason, Lee, mine.
May mine.
McCrary mine.
Mill Knob mine.
Miller (Sanders) mine.
Moody mine.
Moody, Wade. *See* Annie Laurie mine.
Moore. *See* Angel, George, mine.
Moore, A. J., mine.
Moore, Jim, mine.
Morgan, Denver, prospect.
Moss Knob mine.
Mount Hope Church prospects.
Mud Hole mine.
Mud Hole prospect.
Old Bryson. *See* Bryson, Terrell, mine.
Passamore. *See* Turkey Knob mine.
Pendergrass prospect.
Pine Knob. *See* Kelly, Lassie, mine.
Poll Miller (Burningtown) mine.
Poplar Cove prospect.
Quizzenberry mine.
Raby (Grady Duvall) mine.
Ray, Lissie, prospects.
Ray, Tom, prospect.
Ray Cove prospect.
Rickman mine.
Roaring Fork (Norman Mashburn, Smith) mine.
Rocky Face. *See* Henry, Jake, mine.
Rocky Face mine.
Roper, Bud, mine.
Rough Fork mine.
Russell prospect.
Sanders. *See* Miller mine.
Sanders, Doc, mine.
Shepherd Knob (Boyd Knob) mine.
Shotgun mine.
Siphon Hole mine.
Slagle mine.
Slagle-Drake mine.
Smith. *See* Baird mines.
Smith. *See* Roaring Fork mine.
Stamey mine.
Swell prospect.
Taylor, Fred, prospect.
Thorne Mountain Northeast mine.
Thorne Mountain Southwest mine.
Turkey Knob (Passamore) mine.
Turkey Nest mine.
Upper Raby mine.

North Carolina—Continued
Macon County—Continued
Verdell mine.
Welch mine.
Wildes, Jud, prospect.
Winding Stair mine.
Winecoff mine.
Zachary, Hal, mine.
Zoom mine.
McDowell County:
Thunder Knob mine.
Mitchell County:
A. S. O. mine.
Abernathy mine.
Adams mine.
Adams prospect.
Autrey, Al, mine.
Bardon (Bordon) mine.
Bear Creek prospect.
Bearden mine.
Birch mine.
Birdeye. *See* Phillips mine.
Bloodworth mine.
Bordon. *See* Bardon mine.
Branch. *See* Young, Zack, mine.
Buchanan, Adam, mine.
Buchanan, Erby. *See* Buchanan, J. K., mine.
Buchanan, J. K., (Milt Wilson, Erby Buchanan) mine.
Buchanan, Jim, mine.
Buchanan, Jim, prospect.
Buckeye mine.
Bunker Hill mine.
Burleson, W. C., (Joe Stevenson) mine.
Byrd. *See* Byrd, Jeff, mine.
Byrd, Jeff, (Byrd) mine.
Carolina China Clay Co. mine.
Carolina Mineral Co. No. 3 mine.
Carolina Mineral Co. No. 6 mine.
Carolina Mineral Co. No. 12 mine.
Carolina Mineral Co. No. 12 (White) prospect.
Carolina Mineral Co. No. 29 mine.
Carters Ridge prospect.
Case mine.
Chalk Mountain mine.
Chalk Mountain prospect.
Chalk Mountain Northeast prospect.
Chestnut Flat mine.
Chestnut Flat prospect.
Chestnut Flats mine.
Clarissa mine.
Cloudland (Pizzel) mine.
Cook. *See* Sparks, Rube, mine.
Cook mine.
Cook prospect.
Cox prospect.
Cox, Ben, mine.
Cox, Wood, mine.
Cox, Wood, prospect.
Crabtree No. 1 (Wildcat) mine.
Crabtree Northwest prospect.
Crabtree Summit prospect.
Dake. *See* Deake mine.
Davis mine.
Deake (Dake) mine.
Deer Park No. 1 mine.
Deer Park No. 2 mine.
Deer Park No. 3 mine.

North Carolina—Continued
Mitchell County—Continued
Deer Park No. 5 mine.
Devils Looking Glass mine.
Dog Pond mine.
Drawbar mine.
Duck Branch mine.
Eagles Nest mine.
English Knob mine.
Estatoe Northeast (Mossy Rock) prospect.
Estatoe Southeast prospect.
Field mine.
Field prospect.
Flat Rock mine.
Flukens Hill mine.
Glenn mine.
Gopher mine.
Gouge, Slim, prospect.
Gouge Falls prospect.
Graveyard prospect.
Gudger mine.
Guy mine.
Hall and Boone mine.
Harlan mine.
Harlan prospect.
Haw Flat mine.
Hawk mine.
Hawkins mine.
Hootowl mine.
Hootowl prospect.
Hoppus prospect.
Hoppus Northeast mine.
Horton Rock mine.
Howell, George, (Waterhole) mine.
Howell, Jeff, mine.
Jack Rock mine.
Jase mine.
Jase prospect.
Jeff. *See* Jeff Cut mine.
Jeff Cut (Jeff) mine.
Jimmy Cut mine.
Johnson prospect.
Johnson, Ernest, mine.
Johnson, Theo, mine.
Landers mine.
Liberty Hill prospect.
Lick Ridge mine.
Little Hawk Ridge mine.
Long Cut mine.
Lower Sugar Tree Cove mine.
Lower Sugar Tree Cove prospect.
Miller mine (north of Penland).
Miller mine (west of Spruce Pine).
Mossy Rock. *See* Estatoe Northeast prospect.
Mountain Top mine.
Murphy Rock mine (on Crabtree Creek).
Murphy Rock mine (on Rebels Creek).
McBee, Ed, mine.
McChone prospect.
McKinney mine.
McKinney prospect.
New. *See* Wiseman No. 2 mine.
Pannell mine.
Pegram mine.
Penland Southeast prospect.
Pepper Pot (Perrin) mine.
Perrin. *See* Pepper Pot mine.

North Carolina—Continued
- Mitchell County—Continued
  - Phillips (Birdeye) mine.
  - Pine Mountain mine.
  - Pizzel. *See* Cloudland mine.
  - Potato Hill mine.
  - Poteat mine.
  - Poteat prospect.
  - Poteat Southwest prospect.
  - Poteat West prospect.
  - Putman mine.
  - Putman, Marsh, mine.
  - Queen mine.
  - Randall mine.
  - Raven Cliff mine.
  - Renfro mine.
  - Richards prospect.
  - Ridgecrest prospect.
  - Self mine.
  - Silvers Ridge mine.
  - Silvers Ridge prospect.
  - Sinkhole mine.
  - Smith, Calhoun, mine.
  - Smith, Lissie, mine.
  - Soft Ridge mine.
  - Sparks, Ken, mine.
  - Sparks, Rube, (Cook) mine.
  - Stevenson, Joe. *See* Burleson, W. C., mine.
  - Summer mine.
  - Twiggs mine.
  - Upper Crabtree prospect.
  - Vern Muse prospect.
  - Waterhole. *See* Howell, George, mine.
  - White. *See* Carolina Mineral Co. No. 12 prospect.
  - Wildcat. *See* Crabtree No. 1 mine.
  - Willis prospect.
  - Wilson, Milt. *See* Buchanan, J. K., mine.
  - Wiseman No. 2 (New) mine.
  - Wiseman, W. W., mine.
  - Wolfden prospect.
  - Wolfden North prospect.
  - Young prospect.
  - Young, George, mine.
  - Young, S. S., mine.
  - Young, Zack, (Branch) mine.
- Rockingham County:
  - Evans, Rosa, mine.
  - Holland mine.
  - Knight mine.
  - Smith, Ben. *See* Smith, Short Tom, mine.
  - Smith, Ernest, mine.
  - Smith, Short Tom, (Ben Smith) mine.
- Rutherford County:
  - Dycus mine.
  - Isinglass Hill mine.
  - Kay mine.
  - Maurice mine.
  - Stroud, Lax, mine.
- Stokes County:
  - Brown mine.
  - Hawkins (Joe Hawkins) mine.
  - Hawkins, J. C. *See* Ruby King mine.
  - Hawkins, Joe. *See* Hawkins mine.
  - Hole (Jack Hole) mine.
  - Jack Hole. *See* Hole mine.
  - Ruby King (J. C. Hawkins) mine.
  - Shelton, G. R., mine.

North Carolina—Continued
- Stokes County—Continued
  - Spencer mine.
  - Steele mine.
- Transylvania County:
  - Bee Tree No. 1 (Bee Tree Fork) mine.
  - Bee Tree Fork. *See* Bee Tree No. 1 mine.
  - Farlow Gap. *See* Furlow Gap mine.
  - Furlough Gap. *See* Furlow Gap mine.
  - Furlow Gap (Farlow Gap, Furlough Gap) mine.
  - Reid mine.
  - Wagon Road Gap prospect.
- Wilkes County:
  - Creek. *See* Shell, Zolly, mine.
  - Ferguson mine.
  - Hall mine.
  - Proffitt, W. A., mines.
  - Shell, Zolly, (Creek) mine.
- Yancey County:
  - Aley Creek. *See* Ayles Creek mine.
  - Alford mine.
  - Allen, Henry, mine.
  - Allis Creek. *See* Ayles Creek mine.
  - Anglin mine.
  - Autrey (Linzie Autrey) mine.
  - Autrey, J. W., mine.
  - Autrey, Linzie. *See* Autrey mine.
  - Ayles Creek (Allis Creek, Aley Creek) mine.
  - Bailey Mountain mine group.
  - Balsam mine.
  - Barger (Spruce Pine Mica Co. No. 21) mine.
  - Barger prospect.
  - Bee Ridge mine.
  - Bennett. *See* Red mine..
  - Bittner and Beech mine.
  - Black Brothers. *See* McKinney, Chet, mine.
  - Black Dixie mine.
  - Blake (Boomer Tom Young) mine.
  - Bland. *See* Old Gibbs mine.
  - Blevins, D. O.,-Wes Thomas mine.
  - Boomer Tom Young. *See* Blake mine.
  - Boone, Nelson, mine.
  - Boone, W. K., prospect.
  - Branch mine.
  - Brown Creek mine.
  - Buckeye mine (on Crabtree Creek).
  - Buckeye mine (west of Boonford).
  - Carolina Mineral Co. No. 20 mine.
  - Carson Rock mine.
  - Cattail (Cattail Creek, Ison) mine.
  - Cattail Creek. *See* Cattail mine.
  - Celia. *See* Cilley mine group.
  - Chestnut Branch mine.
  - Cilley (Silly, Celia) mine group.
  - Commissary Ridge mine.
  - Cora mine.
  - Creson mine.
  - Eagle Bluff mine.
  - Edge mine (near Fawn Mountain).
  - Edge, John, mine.
  - Edwards mine.
  - Edwards, J. W., mine.
  - Flukens Ridge mine (head of Blue Rock Branch).
  - Flukens Ridge mine group (at Newdale).
  - Georges Fork mine.
  - Gibbs mine.
  - Gibbs, Elmyra, mine.

North Carolina—Continued
Yancey County—Continued
Gibbs Clay. *See* Old Gibbs mine.
Gibbs Spar mine.
Gimbel prospect.
Googrock mine.
Gouge. *See* Shehan, John, mine.
Gouge, Fannie, (Spruce Pine Mica Co. No. 10) mine.
Gouge, Jim, mine.
Green Mountain mine.
Griffin. *See* Griffith, Mills, mine.
Griffith, Mills, (Griffin) mine.
Hall, Andy, mine.
Hall, Cleveland, mine.
Harding (Charley Young) mine.
Harp and Blevins prospect.
Heaton, Sport. *See* McKinney, W. A., mine.
Hector mine.
Hensley-Laurel (Charley Young) mine.
Higgins mine.
Hilliard mine.
Irby Cut mine.
Ison. *See* Cattail mine.
James mine.
Laurel Branch mine.
Laws mine.
Ledford mine.
Letterman, M. P., mine.
Little Zeph mine.
Locust Rough (B. T. Snopp) mines.
Lower Crabtree prospect.
Mathis, Wyman, prospect.
McDowell, Gaston, mine.
McKinney, Chet, (Black Brothers) mine.
McKinney, W. A., (Sport Heaton) mine.
McPeters, Flem, mine.
Middle Ridge mine.
Old Gibbs (Washout, Bland, Gibbs Clay) mine.
Old Owlie mine.
Poll Hill mine.
Presley. *See* Presnell mine.
Presley, S. W., mine.
Presnell (Presley) mine.
Ray (Wray) mine.
Red (Bennett) mine.
Riddle, Jim, mine.
Robinson, Charles, mine.
Robinson, Corb, mine.
Rock mine.
Sally Knob mine.
Shakerig mine.
Shehan, John, (Gouge) mine.
Silly. *See* Cilley mine group.
Silvers mine.
Sleepy Hollow mine.
Snake Den mine.
Snopp, B. T. *See* Locust Rough mines.
Spruce Pine Mica Co. No. 10. *See* Gouge, Fannie, mine.
Spruce Pine Mica Co. No. 21. *See* Barger mine.
Tantrough mine.
Tolley Bend. *See* Tolley Bent mine.
Tolley Bent (Tolley Bend) mine.
Washout. *See* Old Gibbs mine.
Westall mine (on Colberts Ridge).

North Carolina—Continued
Yancey County—Continued
Willis Shanty mine.
Wray. *See* Ray mine.
Young mine (near Harding mine).
Young, Charley. *See* Harding mine.
Young, Charley. *See* Hensley-Laurel mine.
Young, Josh, mine.
Young, Wilt, mine.
Young, Zeph, mine group.
Young, Zeph and Allen, mines.

South Carolina:
Anderson County:
Burgess (L. E. Hunter) mine.
Gaillard mine.
Hunter, L. E. *See* Burgess mine.
Martin, Ben, mine.
Cherokee County:
Blanton, Troy, mine.
Pickens County:
Bolding mine.
Fowler, Will, prospect.
Spartanburg County:
Cowpens mine.

Virginia:
Amelia County:
Berry mine.
Bland. *See* Champion mine.
Champion (Jefferson No. 4, Bland) mine.
Dobbin prospect.
Jefferson No. 4. *See* Champion mine.
Jefferson No. 6 mine.
Ligon mines.
Maria (Old Pinchbeck, Smith) mine.
Mays mine.
McCraw No. 1 (Old Pinchbeck No. 2) mine.
McCraw No. 2 (Old Pinchbeck No. 3) mine.
McCraw No. 3 (Old Pinchbeck No. 1) mine.
Morefield mine.
Old Pinchbeck. *See* Maria mine.
Old Pinchbeck No. 1. *See* McCraw No. 3 mine.
Old Pinchbeck No. 2. *See* McCraw No. 1 mine.
Old Pinchbeck No. 3. *See* McCraw No. 2 mine.
Rutherford mines.
Rutherford No. 2 mine.
Smith. *See* Maria mine.
Vaughn mine.
Wingo mine.
Bedford County:
Young mine.
Charlotte County:
Crews No. 1 prospect.
Crews No. 2 prospect.
Howell prospect.
Goochland County:
Amber Queen mine.
Monteiro (Monteiro Tract) mine.
Monteiro Tract. *See* Monteiro mine.
Hanover County:
Saunders No. 2 mine.
Henry County:
Coleman No. 2 mine.
DeShazo mine.
Eanes No. 2 mine.

Virginia—Continued
- Henry County—Continued
  - Garrett mine.
  - Greer and Merriman mines.
  - Jones No. 1 mine.
  - Jones No. 2 mine.
  - Taylor, Nettie, mine.
  - Morrison, C. R., (Oak Level) mine.
  - Oak Level. *See* Morrison, C. R., mine.
  - Price mine.
  - Ridgeway mine.
- Pittsylvania County:
  - Broomfield prospect.
  - Roach. *See* Sycamore mine.
  - Sycamore (Roach) mine.
- Powhatan County:
  - Dolphin, Clinton, mine.
  - Herbb No. 1 mine.
  - Herbb No. 2 mine.
  - Miller. *See* White Peak No. 1 mine.
  - Purcell. *See* White Peak No. 1 mine.
  - White Peak No. 1 (Purcell, Miller) mine.

COLOR TESTS

METHODS OF TESTING

All lots of mica were classified according to color, so that systematic comparisons could be made between this property and the results of electrical and petrographic tests. Three general methods of classification were considered. Simple inspection, long and successfully used by experienced men in the industry, is rapid but is subject to human errors. Determination of color by means of a chromaticity-difference colorimeter [78] and photometer is an accurate and readily reproducible method and was used by Judd [79] in establishing a color standard for ruby mica. It is based upon the derivation of indices for lightness and hue and gives results in fundamental terms. Unfortunately, however, this method requires time and equipment not available to the writers when the Asheville tests were made. This was true, also, of several other methods that were suggested. Direct visual comparison of the mica with color standards was the scheme finally adopted, as it yields rapid and reproducible results that are accurate within the limits required in the investigations.

The difficulties of judging color by ordinary inspection are clearly summarized by Judd,[80] who notes that the distinction between ruby and nonruby micas "often depends upon color differences so small as to be scarcely perceptible." He goes on to state that

> a given borderline mica will exhibit a progression of colors from nearly colorless through yellowish gray to dark brown, inclining more toward red as the thickness of the specimen viewed is increased; so the inspector must take into account the thickness of the specimen in order to arrive at a judgment characteristic of the mica independent of its thickness. This he does by viewing the mica in several ways; single specimens of various thicknesses viewed against the sky, a handful of specimens viewed against the sky, single specimens of various thicknesses placed on a white surface and viewed by light that passes through each specimen twice, once to illuminate the white surface, once to reach the eye of the observer, and finally directly in the stock box or barrel in an opaque layer by light reflected from the nearly parallel faces of the various specimens in random position at various depths in the pile. His judgment is complicated by the fact that mica from a single mine to be classified exhibits more or less variation in color from specimen to specimen and from spot to spot within the same specimen.

It is true that an experienced inspector learns to apply mental evaluations and comparisons in achieving remarkably good color indentifications for block mica, but his results cannot be as accurate nor as consistent as those based upon direct comparison with material standards. Such standards may themselves change through normal deterioration or through careless use, but they can be checked from time to time against more absolute standards.

All samples used for color classification in the present tests comprised pieces of mica at least 1¼ inches long and half an inch wide. These were cleaved to a uniform thickness of 15 mils (0.015 inch) and were then correlated with elements of the filter-type color chart prepared by Ridgway.[81] Direct comparisons were made by means of a white sheet of cardboard, each test being placed upon the sheet beside a rectangular hole slightly smaller than one of the colored elements of the chart. The cardboard was moved until one of the standard colors, as seen through the hole, could be matched with the mica under test. All comparisons were made under illumination from two General Electric 17-inch 3,500° white fluorescent lamp tubes placed 15 inches above the working surface. No difficulty was experienced in satisfactorily matching the test pieces with the standard colors of the chart, although great care was necessary in the observation of samples heavily stained by clay or other minerals.

RESULTS

More than 75 different colors were identified among the micas tested. No samples were found to match pure spectrum colors or intermediate hues; instead, the identifications reflect variations in lightness, or tone, and variations in brightness and dullness. In general the colors range from buff and drab through shades of brown and green to pale yellowish green.[82]

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[78] Judd, D. B., Specification of uniform color tolerances for textiles: Textile Research, vol. 9, p. 258, 1939.

[79] Judd, D. B., Color standard for ruby mica: Nat. Bur. Standards Jour. Research, vol. 35, pp. 245–256, 1945.

[80] Judd, D. B., Color standard for ruby mica: Nat. Bur. Standards Jour. Research, vol. 35, pp. 245–246, 1945.

[81] Ridgway, Robert, Color standards and color nomenclature, 43 pp., 53 color pls., Washington, D. C., 1912.

[82] Jahns, R. H., Color characteristics of sheet muscovite in the Southeastern States (abstract): Geol. Soc. America Bull., vol. 56, p. 1170, 1945.

They are readily grouped into seven main categories, as follows:

Main color categories	*General terms of the trad*
Pinkish buff and drab	
Cinnamon brown	Ruby
Brown	
Brownish olive	Rum
Yellowish olive	
Yellowish green	Green
Green	

None of the colored groups is sharply bounded, and all gradations between groups adjacent on the list are known. Each is easily subdivided on the basis of light tints and dark shades, as well as in terms of relative brightness or dullness. The darkest shades are browns and brownish olives; the lightest tints, those of yellowish green, buff, and drab. The results of the color tests are included in table 10.

In general the buff, drab, and cinnamon-brown micas are the "ruby" micas of the trade, and the brown and brownish-olive varieties are the so-called "rum" micas. The trade terms are inexact and are not everywhere consistently used, so that only a generalized correlation between them and the more accurate color designations has been attempted. In many instances the trade terms are misnomers. As pointed out by Judd,[83] most specimens that are near the ruby-nonruby border line actually are weak yellow, very pale brown, or pale brown according to more appropriate designations.[84]

It has been indicated in previous sections of this report that few mica books are colored uniformly throughout. Color zoning, with gridiron or chessboard patterns, concentric color bands parallel to crystal outlines, stripes parallel to pressure-figure directions, and faint, irregular mottling are widespread. Further, nearly all books contain pale rims that tend to be more greenish than the interior. Ordinarily, however, it is possible to assign a single general color to a given sheet of mica, and it is only in exceptional instances that two or more distinct colors merit individual note in this connection. (See table 10.)

Although variations within individual books are common, the color of muscovite in the Southeastern deposits is fairly constant within a single shoot or even within a single zone in the pegmatite body in which it occurs. Micas of more than one general color are known from many pegmatites, but they typically occur in separate concentrations within those pegmatites. Where green and brown muscovite occur in the same pegmatite body, the brown is near the walls. Those pegmatites with green book muscovite near their walls contain no brown books and generally contain no biotite other than that possibly derived through reaction with wall-rock material. Biotite is characteristically associated with buff, drab, and brown muscovite.

Most of the book muscovite in the Piedmont province is brown and pinkish, in marked contrast to that in the Blue Ridge province. Green mica in the Piedmont province is common only in the Ridgeway-Sandy Ridge district and in numerous outlying areas in Virginia and North Carolina. Pinkish and brown micas in the Blue Ridge province are common only in the Franklin-Sylva district, in outlying parts of the Spruce Pine district, and in areas farther north. The outer parts of many color-zoned books in the Alabama deposits are green.

Broad and systematic color variations in the mica of some areas appear to be related to nearby masses of intrusive rock that probably are genetically related to the pegmatites. Such variations are particularly clear in the Spruce Pine, Franklin-Sylva, Hartwell, and Ridgeway-Sandy Ridge districts. The pegmatites in and near the intrusive masses generally contain muscovite of dominantly green color, whereas those farther from such masses are more likely to contain buff, drab, or brown muscovite.

PETROGRAPHIC EXAMINATION

STAINING AND INCLUSIONS

Nearly all lots of mica were examined megascopically for staining and inclusions and then were further studied under the petrographic microscope. Many of the test pieces contain mineral stains in the form of intergrown hematite, magnetite, and biotite, either singly or in combination, but only 286 lots—13.3 percent of the total—consist of such stained pieces to the extent of 25 percent or more (table 9). The amount of stain varies greatly from one lot to another and even from one piece of mica to another. The bulk of material in 96 lots—4.5 percent of the total—is marred by moderate to large quantities of such impurities, but numerous other samples are entirely clear, and still others contain biotite or iron oxides in such minor quantities or in such tiny specks that they are virtually clear.

The proportion of material with mineral stain and the type and distribution of stain in each lot are indicated in columns 6 and 7 of table 10. It should be pointed out that these data apply only to the mica that was tested and hence may or may not represent the

[83] Judd, D. B., Color standard for ruby mica: Nat. Bur. Standards Jour. Research, vol. 35, p. 248, 1945.

[84] Judd, D. B., and Kelly, K. L., Method of designating colors: Nat. Bur. Standards Jour. Research, vol. 23, p. 355, 1939.

average of all material obtainable from any given mine.

TABLE 9.—*Occurrence of stain in 2,148 test lots of muscovite from the Southeastern States*

Type of stain	Number of lots	Proportion of total lots (percent)
Hematite and/or magnetite and/or biotite intergrowths (mineral stain) present	550	25.6
Mineral stain in 25 percent or more of test pieces	286	13.3
Moderate to large quantities of mineral stain in most test pieces	96	4.5
Vegetable stain and/or green mottling and/or brown mottling present in one or more test pieces	192	8.9
Clay stain and/or iron stain and/or manganese stain present in one or more test pieces	514	23.9

Much of the included hematite and magnetite occurs as specks (less than 0.5 millimeter or 0.02 inch in diameter), small spots (0.5 to 1.5 millimeters or 0.02 to 0.06 inch in diameter), or large spots (more than 1.5 millimeters or 0.06 inch in diameter). Nearly all the spots and specks of magnetite have rather smooth and regular edges, but a substantial proportion of the hematite occurs in simple or complex dendritic forms. The designations "dendrite specks" and "dendrite spots" are appropriate for these irregular particles. Numerous large inclusions are most easily referred to as "plates," "laths," or "blotches." "Blotches" are irregular masses or groups of masses whose diameters generally are greater than 3 millimeters. The arrangement and distribution of stain and inclusions are readily described by means of such terms as "rows," "belts," "triangular lattices," "rectangular lattices," "clusters," "sprays," "clouds," "scattered," "widespread," "local," and "isolated."

Biotite that is intimately intergrown with muscovite as very thin films without good crystal form is considered a type of mineral stain in this report. Individual films are platy, wispy, or shredlike and commonly cause the host muscovite to appear greenish or brownish and distinctly curdy. The biotite staining is concentrated near the centers of some muscovite books, and locally, where it forms triangular latticelike patterns, it closely resembles some of the lighter-colored types of hematite intergrowths. In contrast to the "mineral-stain" type of biotite are larger, euhedral inclusions of brown or black biotite, some of which are an eighth of an inch or more in thickness. These seem best classed with inclusions of such minerals as apatite, garnet, pyrite and other sulfide minerals, quartz, tourmaline, zircon, and zoisite. When removed, inclusions of this type leave holes or distinct depressions in the host muscovite. Their occurrence and distribution in the tested material are summarized in table 10, column headed "Remarks."

Green and brown mottling, vegetable stain of the inorganic type, and several other forms of pale, curdy stain mar some or all test pieces of 192 lots, or nearly 9 percent of all lots examined (table 9). Much of this thin, finely divided foreign material occurs in specks, spots, lines, rows, clumps, clusters, or more irregular aggregates. "Bursts" and "cigarette burns," large spots with dark, opaque centers and pale, irregular margins, are abundant in some of the lots (table 10).

Clay stains are widespread, and nearly a fourth of the test lots include some pieces of mica marred by this defect (table 9). Secondary iron oxide stains are almost as abundant, but manganese oxide stains are common in only a few lots. None of the pieces of Southeastern mica is appreciably air-stained.

Hematite is the most abundant staining mineral in the entire mass of tested mica, but inclusions of this mineral are rare in the buff or brown micas. Nor is magnetite abundant in such material. In contrast, shredlike intergrowths of biotite are common in muscovite of nearly all colors. Ordinarily the biotite in green muscovite is green, whereas that in brown and buff muscovite is deep brown. The coarse, euhedral type of biotite generally is intergrown with reddish muscovite, rarely with green. It is very rare in material that is marred by hematite or magnetite stains. Garnet appears to be a characteristic associate of green muscovite; apatite, of the buff and brown varieties.

In general stained mica is most abundant in the outer parts of the containing pegmatite body and also is concentrated along the margins of wall-rock septa and inclusions. Pegmatites with core-margin or other centrally distributed concentrations of stained mica generally contain few clear green books, and those with wall-zone concentrations of clear green mica rarely contain many stained books. Stained mica is abundant in some pegmatites with wall-zone concentrations of buff or brown books but is rare in those with centrally located concentrations of such books.

PINHOLES AND HAIR CRACKS

Pinholes are tiny flaws that generally extend through only a few laminae of the host mica book. Many are extremely difficult to detect without the aid of a microscope or suitable spark-test apparatus, and a substantial proportion of condenser failures may well be attributable to the presence of such imperfections in visually qualified mica. Hair cracks (or hair lines), the extremely thin, fine cracks that cause failure of laminae during filming, are somewhat more easily recognized by careful inspection, although many of them do not become apparent until the mica is split into very thin sheets.

In the present investigation no attempt was made to determine the proportion of pinholed sheets in each lot of mica by means of petrographic examination alone, as such quantitative data were much more readily obtained during the electrical testing. On the other hand, it was possible to demonstrate under the microscope that most pinholes are formed by the "popping out" of tiny inclusions of zircon, apatite, garnet, and other "stony" minerals. Not only are such inclusions similar in size and shape to the pinholes occurring in the same lot of mica, but the general proportion of these inclusions in block mica can be correlated with the proportion of pinholed films obtained from the blocks. Moreover, it has been long recognized by experienced mica inspectors that the proportion of pinholes in a given lot of mica increases during its preparation and especially during filming, presumably as a result of separation of the stony inclusions from the mica laminae. These imperfections are much more abundant in the brown and buff, or ruby, micas than in the green ones, probably because of the greater numbers of zircon and apatite inclusions in the brown and buff varieties.

Some hair cracks are irregular, with trends that do not form a recognizable pattern within the host book of mica. Most, however, are straight and systematically disposed. Many of these appear to be ruling developed on a very small scale, whereas others are parallel to rays of the percussion figure. According to some mica buyers, hair cracks commonly develop after the rifting and trimming of sheet mica from certain deposits, particularly if the books are not thoroughly dried before preparation. If such block mica is filmed promptly, however, relatively few hair cracks are said to form. This may well be true, but it also is known that hair cracks are much more readily recognizable in mica films than in book or block material. In general these tiny imperfections are more abundant in green micas than in the brown and buff, or ruby, varieties. They are especially common in the yellowish-olive books from several mines in the Spruce Pine district.

ELECTRICAL TESTS

APPARATUS AND METHODS OF TESTING

The Bell Telephone Laboratories' resonance-circuit vacuum-tube-voltmeter portable set D-167113 was used to determine the *Q* value of all samples of block mica, and the spark-coil test set D-167407 was used to establish the presence of pinholes, cracks, and conducting impurities. The circuits and operation of these instruments have been described in a foregoing section of this report. Before the testing began, the Q-meter was overhauled, cleaned, and checked for satisfactory tube characteristics, battery voltages, and calibrations. The meter was again checked by the supervisor of the electrical work before actual test runs were begun, and it was rechecked after each 2-hour period to insure continued accuracy. It was operated throughout each 8-hour work day for the duration of the program.

Three women, selected on the basis of their knowledge and experience in the rifting, trimming, and visual inspection of sheet mica, were contracted to prepare the samples and operate the test sets. Each was trained to adjust, calibrate, and manipulate the electrical equipment. All work was done in a non-air-conditioned ground-floor room, 25 feet wide and 40 feet long. The relative humidity varied from 45 percent to 98 percent, and the temperature from 68° to 97° F. The spark-test machine was used in a darkened room, so that the operator could readily distinguish any conducting material or structural flaws in the samples.

The entire program was organized on a continuous production-line basis. The mica books were rifted by one operator, placed in labeled boxes, trimmed by a second operator to sizes recommended by the American Society for Testing Materials, and then tested in the Q-meter by the third operator. Job assignments were rotated each day, in order to avoid monotony and increase the efficiency of the work. In only a few days the women acquired sufficient technique and skill to test adequately 15 to 25 mica specimens per minute on the Q-meter. The best operator was able to test 20 specimens per minute for periods of 15 minutes or more. Even so, the time and precision required for the Q-meter work made it the slowest part of the procedure, and some balancing of operations was necessary. This was done by assigning either of the workers engaged in preparing the mica to operation of the spark-test set for appropriate periods.

In the *Q*-value or power-factor test, the pieces of mica were designated as E-1, E-2, or E-3, and the results of all 30-mil stack tests were recorded. After each lot of mica was tested, it was placed in paper envelopes according to its electrical classification. Washer material was kept in separate bags. The lots were then counted, labeled, and checked, and the numbered envelopes were boxed in groups of 50 and taken to the spark-test bench. In the spark testing a record was made of all mica with conducting impurities, hair cracks, and pinholes, and the general proportion of pieces with conducting material or other defects was noted for each lot (table 10). The samples also were inspected visually, and a record was made of color, transparency, and any stain or large cracks that were present.

GENERAL TESTS

The results of the general electrical tests are listed by sample lot and by mine in table 10, where they are correlated with descriptions of color, transparency, and other properties of the mica. Of the 2,502 lots tested with the Q-meter 2,441, or 97.6 percent, contained only mica that lay within the 95–100 range on the dial and hence qualified as E-1 material. All the mica in 16 lots was classed as E-2 in quality, and all of that in two other lots as E-3. Of the remaining samples 21 contained E-1 and E-2 material, 19 contained E-1, E-2, and E-3, and 3 consisted of E-2 and E-3 pieces only. The results of electrical tests of the samples that include material of other than E-1 quality are listed separately in tables 11 and 14.

In terms of individual test pieces, 229,781 of the total 237,764 specimens—more than 96.6 percent—qualified as E-1; 4,747 specimens were classed as E-2 and 3,236 as E-3. Most of the E-2 and E-3 mica was slightly to heavily stained with magnetite or hematite, and approximately half of it was so badly clay-stained, iron-stained, rippled, reeved, cracked, or otherwise blemished that it could be classed only as washer stock. Some electrically inferior sheets, on the other hand, were perfectly clear and otherwise of excellent appearance.

Of the 61 lots containing mica of E-2 or E-3 quality, 29 were obtained from mines in the Spruce Pine district, N. C.; 5 from the Shelby-Hickory district, N. C.; 11 from the Franklin-Sylva district, N. C. and Ga.; 2 from Charlotte County, Va.; 4 from Troup County, Ga.; and 1 from Tallapoosa County, Ala. Nine lots were not specifically identified as to source. This distribution by no means reflects the general quality characteristics of sheet mica in one area or another, as no attempt was made to obtain the original samples in any systematic manner with respect to such factors as the relative production of mica and the relative quantities of mineral-stained mica in each area.

There is little correlation between power factor and color of the test pieces, or between power factor and amount of shredlike biotite inclusions, mottling, vegetable stain, large biotite inclusions, or brown bursts in the test pieces. The spark tests verified the presence of cracks and holes in much of the trimmed sheet material, and a few of the hematite and magnetite inclusions in some pieces reacted as conducting substances (table 10). Pinholes and hair cracks were found to be much more common than they appeared to be on the basis of careful visual examination and were present in some of the test pieces that ordinarily would have qualified as No. 1.

The testing program included the study of 550 lots that contained a total of more than 39,000 pieces of very slightly to densely mineral-stained mica. Nearly half of these pieces were typical No. 3 or electric stock, with scattered to dense specks, spots, blotches, laths, and lattices of iron oxides. Most of the mica was found to be E-1, and less than a tenth of it could be classed as E-3. A 15,987-piece sample of half- and three-quarter-trimmed No. 3 material from the Knight mine, Rockingham County, N. C., tested 61 percent E-1, 23 percent E-2, and 16 percent E-3. Only 3 percent of the mica contained conducting impurities. Most of the specimens were heavily stained with brown to black hematite, and the entire lot was a representative sample of the lowest-quality sheet mica from the mine. There appears to be a partial correlation between power factor and the amount of hematite-magnetite stain in the mica, in that most of the E-2 and E-3 pieces were heavily stained, but evidently there are numerous exceptions. Some pieces that qualified as E-1, for example, were more densely stained than many with a higher power factor.

GENERAL TEST DATA FOR MICA SPECIMENS

TABLE 10.—*General test data for mica specimens, arranged by lot and by mine or prospect*

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Type of mineral stain	Remarks	Electrical tests: Number of lots tested	Total number of pieces tested	Percent E-1	Percent E-2	Percent E-3	30-mil stack (number of stacks in parentheses)	Proportion of tested defects (to nearest 5 percent): Material with conducting substances	Material with cracks	Material with pinholes
"A" mine	Franklin-Sylva	Macon, N. C.	6	Pale cinnamon brown; streaks of dull yellowish olive.	25	Belts of magnetite laths, specks, and spots.	Slightly clay-stained.	1	27	100	0	0		0	0	0
"A" mine (on Brushy Creek).	Spruce Pine	Avery, N. C.	Washer	Dull yellowish olive.	100	Scattered specks and spots of hematite and magnetite.	Clay-stained.	1	8	100	0	0		0		100
"A" mine (on Little Elk Ridge).	do	do	6	Light yellowish to brownish olive.	100	Abundant specks and spots of hematite and magnetite.	Slightly clay-stained.	1	51	100	0	0	E-1 (1)	0	0	0
Do.	do	do	Washer	do	100	do	do	1	8	100	0	0		0	0	0
A.S.O. mine	do	Mitchell, N. C.	6, 7	Yellowish to brownish olive.	Trace	Rare dendrite specks of hematite.	Clay-stained.	1	112	100	0	0	E-1 (1)	0	0	0
Do.	do	do	Washer	do	<5	do	do	1	12	100	0	0				
Abbs Creek mine	Franklin-Sylva	Jackson, N. C.	do	Dull yellowish olive.	Trace	Rare magnetite specks.	Clay-stained; local curdy brownish mottling.	1	13	100	0	0		0	0	0
Abernathy mine	Spruce Pine	Mitchell, N. C.	3, 4, 5, 5½, 6, 7.	Cinnamon brown.	Trace	Scattered hexagonal specks and spots of magnetite.	Slightly clay-stained; faint vegetable stain locally; rare curdy brown stain.	9	911	100	0	0	E-1 (7)	0	5	10
Do.	do	do	Washer	do	5	do	do	2	26	100	0	0		0	0	0
Abernathy Long Cut (Hickory) mine.	Shelby-Hickory	Catawba, N. C.	6, 7	do	Trace	Scattered hematite dendritespots and biotite shreds near centers of some books.	Clay-stained; pale-green mottling; local small brownbursts.	4	407	100	0	0	E-1 (1)	0	0	0
Do.	do	do	Washer	do	75	do	do	1	8	100	0	0				
Abernathy Water mine.	do	do	6, 7	Pinkish buff to cinnamon brown.	25	Sparse specks and spots of hematite and magnetite.	Slightly clay-stained; pale-green mottling.	1	79	100	0	0		0	0	0
Adams mine	Spruce Pine	Mitchell, N. C.	7	Yellowish olive.	25	Scattered spots of hematite and magnetite.	Slightly clay-stained.	1	47	100	0	0		0	0	0
Adams mine	Thomaston-Barnesville.	Upson, Ga.	5, 5½, 6, 7.	Brownish olive to cinnamon brown.	Trace	Sparse dendrite specks and spots of hematite.	Slightly clay-stained; widespread green mottling; sparse brownbursts.	4	634	99+	Trace	0	E-1 (2)	0	3	0
Adams prospect	Spruce Pine	Mitchell, N. C.	Washer	Green	0		Clay-stained.	1	3	100	0	0		0	0	0
Aldrich mine	do	Avery, N. C.	6, 7	Brownish olive.	Trace	Locally abundant plates and laths of green biotite.	Rare brown bursts.	1	40	100	0	0		0	0	0
Do.	do	do	Washer	do	75	do	do	1	21	100	0	0				
Alford mine	do	Yancey, N. C.	5, 6	Not determined.	0			1	115	100	0	0	E-1 (1)	20	0	50
Alfred mine	do	Avery, N. C.	5, 6	Brown	Trace	Rare dendrite specks of hematite and shreds of biotite.	Some faint vegetable stain.	1	36	100	0	0	E-1 (1)	0	0	0
Do.	do	do	Washer	do	Trace	do	do	2	27	100	0	0		0	0	0
Allen, Henry, mine (in Zeph Young group).	do	Yancey, N. C.	3, 4, 6	Yellowish to brownish olive.	50	Scattered specks and spots of magnetite and hematite.		3	163	100	0	0	E-1 (2)	0	0	0
Do.	do	do	Washer	do	60	do		2	29	100	0	0				

Allman Cove mine.	Franklin-Sylva	Macon, N. C.	6	Cinnamon brown.	0		Slightly clay-stained; rare tiny apatite inclusions.	3	126	100	0	0	E-1 (3)	0	0	0
Amber Queen mine.	Outlying Virginia.	Goochland, Va.	6	Brown to cinnamon brown.	Trace	Rare magnetite specks.	Clay-stained	2	77	100	0	0		0	0	0
Ammons (Henry) mine.	Franklin-Sylva	Macon, N. C.	6	Dark brownish olive.	75	Dendrite specks and spots of hematite with some magnetite spots.	Sparse, very pale green mottling.	1	54	100	0	0		0	0	0
Do	do	do	Washer	do	0	do	do	1	12	100	0	0				
Anderson mine	do	do	6	Cinnamon brown.	0		Sparse reddish-brown dendrite spots and bursts.	1	21	100	0	0		0	0	0
Angel, George, (Cabe, Moore) mine.	do	do	Washer	Pale brownish olive, with some light-brown streaks.	25	Magnetite specks and spots with some hematite blotches.	Clay-stained	1	21	100	0	0		0	0	0
Angel, Mel, mine	do	do	6	Pale yellowish green with pinkish-buff streaks.	<5	Rare magnetite specks.		1	34	100	0	0	E-1 (1)	0	0	0
Anglin mine	Spruce Pine	Yancey, N. C.	5½, 6	Yellowish to brownish olive.	0		Slightly clay-stained.	2	131	100	0	0	E-1 (1)	0	0	0
Annie Laurie (Wade Moody) mine.	Franklin-Sylva	Macon, N. C.	6	Cinnamon brown, with some yellowish olive to brownish olive.	0		Rare pale-brown mottling; rare brown dendrite specks.	1	16	100	0	0		0	0	0
Anthony prospects.	Shelby-Hickory	Cleveland, N. C.	6	Light cinnamon brown.	5	Rare magnetite specks.	Clay-and iron-stained.	1	55	100	0	0		0	0	0
Archie mine (in Archie Norman group).	do	do	5, 6	Cinnamon brown.	5	Sparse dendrite specks and small spots of hematite.	Slightly clay-stained.	3	359	100	0	0	E-1 (2)	0	0	0
Do	do	do	Washer	do	55	do	do	1	11	100	0	0				
Arnold, Fred, prospect.	Franklin-Sylva	Macon, N. C.	do	Yellowish olive to brownish olive.	100	Dendrite spots and blotches of hematite; some much altered.	Clay-stained	1	19	100	0	0		0	0	0
Arnott mine	Alabama	Randolph, Ala.	5½, 6	Cinnamon brown.	Trace	Sparse magnetite and hematite specks and spots near rims of books.	Slightly clay-stained.	2	367	100	0	0	E-1 (1)	0	0	0
Arrowwood mine	Franklin-Sylva	Macon, N. C.	5, 5½, 6	do	5	Rare magnetite spots and specks, with some hematite.	Sparse pale-green mottling; rare green dendrite spots and bursts.	4	714	100	0	0	E-1 (1)	0	5	0
Do	do	do	Washer	do	0	do	do	3	19	100	0	0				
Ashe, Bob, mine	do	Jackson, N. C.	6, 7	Light cinnamon brown.	<5	Rare magnetite specks.	Clay-stained	1	18	100	0	0		0	0	0
Autrey (Linzie Autrey) mine.	Spruce Pine	Yancey, N. C.	3, 4, 6	Cinnamon brown.	<5	Sparse magnetite and hematite specks and spots.	Slightly clay-stained.	3	52	100	0	0	E-1 (1)	0	0	0
Autrey, Al, mine	do	Mitchell, N. C.	Washer	Dark yellowish olive.	20	Sparse hematite dendrite specks with curdy brown hematite lattices.		1	100	0	100	0		0	0	25
Autrey, J. W., mine.	do	Yancey, N. C.	5, 5½, 6, 7.	Cinnamon brown.	Trace	Rare magnetite specks and spots; rare hematite dendrite specks.	Slightly clay- and iron-stained; local rows of dark-green to brown dendrite specks; local curdy brown stain in a few books.	6	413	100	0	0	E-1 (5)	0	Trace	Trace
Do	do	do	Washer	do	Trace	do	do	2	15	100	0	0				
Ayles Creek (Allis Creek, Aley) mine.	do	do	5, 6, 7	Yellowish olive to cinnamon brown.	Trace	Rare hematite dendrite specks.	Sparse brown to yellowish-green bursts, biotite intergrowths; locally iron-stained.	3	111	100	0	0	E-1 (3)	0	0	0
Do	do	do	Washer	do	Trace	do	do	2	23	100	0	0				

TABLE 10.—*General test data for mica specimens, arranged by lot and by mine or prospect*—Continued

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Type of mineral stain	Remarks	Electrical tests						Proportion of tested defects (to nearest 5 percent)		
								Number of lots tested	Total number of pieces tested	Percent E-1	Percent E-2	Percent E-3	30-mil stack (number of stacks in parentheses)	Material with conducting substances	Material with cracks	Material with pinholes
Bailey mine	Franklin-Sylva	Macon, N. C.	6	Light brown to cinnamon brown, with nearly colorless streaks.	0		Clay-stained	1	23	100	0	0		0	0	0
Do.	do.	do.	Washer	do.	0		do.	1	6	100	0	0				
Bailey mine	Hartwell	Hart, Ga.	5, 6, 7	Pale brownish olive to brown.	10	Rare magnetite spots and dendrite specks of hematite.		2	73	100	0	0	E-1 (2)	0	0	0
Do.	do.	do.	Washer	do.	50	do.	do.	1	12	100	0	0				
Bailey Mountain mine group.	Spruce Pine	Yancey, N. C.	5, 6, 7	Brownish olive to brown.	100	Dendrite spots and blotches of hematite; some coarse triangular lattices.		3	182	100	0	0	E-1 (2)	0	0	0
Bailey Mountain mine group, tunnel in.	do.	do.	6	Yellowish to brownish olive.	<5	Sparse magnetite spots and specks.	Rare pale-green dendrite spots.	1	8	100	0	0	E-1 (1)	0	0	0
Baird (Smith) mines.	Franklin-Sylva	Macon, N. C.	3, 4, 5	Cinnamon brown.	0			4	796	100	0	0	E-1 (2)	0	20	0
Do.	do.	do.	Washer	do.	0			1	11	100	0	0				
Bald Ridge mine.	do.	Jackson, N. C.	do.	Pale cinnamon brown.	0		Clay- and iron-stained.	1	9	100	0	0		0	0	0
Balsam mine	Spruce Pine	Yancey, N. C.	3, 4, 5, 6	Cinnamon brown to light brownish olive.	<5	Rare dendrite spots of hematite, with local triangular lattices of brown biotite wisps.	Sparse brown bursts and pale-brown mottling; zircon inclusions.	5	717	100	0	0	E-1 (4)	0	0	5
Do.	do.	do.	Washer	do.	<5	do.	do.	2	35	100	0	0				
Bardon (Bordon) mine.	do.	Mitchell, N. C.	6	Pale cinnamon brown.	Trace	Rare magnetite spots.	Slightly clay-stained.	1	40	100	0	0		0	0	0
Do.	do.	do.	Washer	do.	<5	do.	do.	1	5	100	0	0				
Barger (Spruce Pine Mica Co. No. 21) mine and Barger prospect.	do.	Yancey, N. C.	5, 6, 7	Brownish olive.	<5	Scattered dendrite spots of hematite.	do.	5	420	100	0	0	E-1 (3)	0	0	0
Barron (Bennie Barron, Walker Wakefield) mine.	Thomaston-Barnesville.	Upson, Ga.	6	Cinnamon brown.	0		Clay- and iron-stained; sparse biotite plates.	1	98	100	0	0		0	0	0
Battles mine	do.	Monroe, Ga.	4, 5, 5½, 6, 7.	do.	0		Clay-stained; local green mottling; rare brown bursts.	5	729	100	0	0	E-1 (3)	0	0	<5
Do.	do.	do.	Washer	do.	0		do.	1	11	100	0	0				
Baxter, Jack, (Tom Baxter) mine.	Shelby-Hickory	Lincoln, N. C.	5, 5½, 6, 7.	Light cinnamon brown, with streaks of light yellowish green.	Trace	Rare specks of magnetite and hematite.	Heavily clay-stained and iron-stained.	14	1877	100	0	0	E-1 (12)	<5	0	Trace
Do.	do.	do.	Washer	do.	Trace	do.	do.	2	30	100	0	0		0	0	0
Baxter, Jack, prospect.	do.	do.	6	Cinnamon brown.	0		Clay-stained; rare brown bursts.									
Do.	do.	do.	6	Pale yellowish green.	80	Dendrite specks and spots of hematite, with some triangular lattices.		1	86	100	0	0		0	0	0

Beam prospect	do	do	6, 7	Pinkish buff to cinnamon brown with pale-greenish streaks.	75	Sparse laths and specks of magnetite.	Clay-stained	1	50	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	100	do	do	1	13	100	0	0				
Beam, Claude, prospect.	do	Gaston, N. C.	6, 7	Pinkish buff with many streaks of pale yellowish olive.	25	Sparse magnetite specks and hematite dendrite specks.	do	2	263	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	0	do	do	1	17	100	0	0				
Bear Creek prospect.	Spruce Pine	Mitchell, N. C.	6	Brownish olive	20	Scattered dendrite spots of hematite.	Local green mottling.	1	81	100	0	0		0	0	0
Bearden mine	do	do	6, 7	Yellowish green to brownish olive.	75	Scattered dendrite specks and spots of hematite.	Garnet inclusions.	1	45	100	0	0	E-1 (1)	5	0	0
Bearpen mine	Franklin-Sylva	Macon, N. C.	Washer	Cinnamon brown.	0			1	8	100	0	0		0	0	0
Beasley No. 1 (Bradley Butt) mine.	do	do	5, 6	Light cinnamon brown.	<5	Rare specks of magnetite and dendrite specks of hematite.		1	73	100	0	0	E-1 (1)	0	0	0
Beasley No. 2 mine.	do	do	5, 5½, 6	Cinnamon brown with broad stripes of pale brownish olive.	<5	Dark-green spots and blotches; rare black iron oxide spots.	Clay-stained; scattered pale vegetable stain; very pale green mottling.	7	962	100	0	0	E-1 (4)	0	10	<5
Do	do	do	Washer	do	0	do	do	3	34	100	0	0				
Bee Ridge mine	Spruce Pine	Yancey, N. C.	6	Cinnamon brown with yellowish-olive streaks; some books very dark brownish olive.	0	Sparse magnetite and hematite spots and specks.	Biotite intergrowths.	2	55	100	0	0		0	0	0
Do	do	do	Washer	do	55	do	do	2	11	100	0	0		0	0	0
Bee Tree No. 1 (BeeTree Fork) mine.	Franklin-Sylva	Transylvania, N. C.	5, 5½, 6	Light pinkish buff, with local greenish tinges.	0		Scattered reddish-brown to green dendrite specks.	3	337	100	0	0	E-1 (2)	0	0	5
Do	do	do	Washer	do	0		do	1	15	100	0	0				
Benfield mine	Spruce Pine	Avery, N. C.	do	Cinnamon brown.	50	Sparse dendrite specks of hematite and shreds of biotite.	Rare green dendrite specks; green mottling.	1	14	100	0	0		0	0	0
Benfield, Byard, mine.	do	do	3, 4, 5, 6	do	0	Local pale-green mottling and rows of dark-green dendrite spots; biotite intergrowths.		4	169	100	0	0	E-1 (2)	0	0	0
Do	do	do	Washer	do	0	do		2	21	92	8	0				
Berry mine	Alabama	Tallapoosa, Ala.	5, 6, 7	Yellowish olive	100	Triangular lattices of hematite, chiefly in dendrite spots and laths.	Clay- and iron-stained.	2	277	100	0	0	E-1 (2)	10	0	5
Do	do	do	Washer	do	100	do	do	1	15	100	0	0				
Berry mine	Amelia	Amelia, Va.	6, 7	do	0		Clay-stained; very pale green mottling.	1	75	100	0	0		0	0	0
Berry mine	Franklin-Sylva	Macon, N. C.	4, 5, 5½, 6, 7.	Pinkish buff, with rare pale brownisholive.	Trace		Heavily clay- and iron-stained; sparse green and brown bursts; sparse pale-green vegetable stain and heavy green mottling; rare shreds of biotite.	43	8,607	.100	0	0	E-1 (43)	Trace	<5	5
Do	do	do	Washer	do	0		do	3	26	100	0	0				

TABLE 10.—*General test data for mica specimens, arranged by lot and by mine or prospect*—Continued

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Type of mineral stain	Remarks	Electrical tests: Number of lots tested	Total number of pieces tested	Percent E-1	Percent E-2	Percent E-3	30-mil stack (number of stacks in parentheses)	Proportion of tested defects (to nearest 5 percent): Material with conducting substances	Material with cracks	Material with pinholes
Bess mine	Shelby-Hickory	Lincoln, N. C.	6, 7	Pinkish buff	0		Clay-and iron-stained; very pale green mottling.	1	79	100	0	0		0	0	0
Do	do	do	6, 7	Yellowish green	5	Abundant magnetite spots.	Clay-stained									
Do	do	do	Washer	Pinkish buff	0		Clay-and iron-stained; very pale green mottling.	1	18	100	0	0		0	0	65
Do	do	do	do	Yellowish green	100											
Betts Gap mine	Franklin-Sylva	Jackson, N. C.	do	Yellowish olive to cinnamon brown.	0		Heavily clay- and iron-stained.	1	7	100	0	0		0	0	0
Bettys Creek No. 1 mine.	do	do	do	Cinnamon brown.	0		Clay-stained	1	8	100	0	0		0	0	0
Big Bess mine	Shelby-Hickory	Gaston, N. C.	5, 6, 7	Pinkish buff	Trace	Rare specks and spots of magnetite and hematite.	Slightly clay-stained; local pale-green vegetable stain.	3	775	100	0	0	E-1 (2)	0	Trace	10
Big East Fork mine.	Franklin-Sylva	Jackson, N. C.	6, 7	Cinnamon brown, with yellowish-olive streaks.	Trace	Sparse magnetite specks.	Rows of green dendrite specks.	1	19	100	0	0		0	0	0
Big Flint (Grassy Ridge, Glassey Rock) mine.	do	do	5, 5½, 6, 7.	Cinnamon brown with some pale brownish olive.	0		Clay-stained; sparse brown bursts and reddish-brown dendrite spots; rare dark-green blotches.	4	493	100	0	0	E-1 (4)	0	0	0
Do	do	do	Washer	do	0		do	1	12	100	0	0				
Big Ridge mine	do	Haywood, N. C.	2, 3, 4, 5, 5½, 6, 7.	Cinnamon brown with streaks of yellowish to brownish olive.	15	Rare clusters of tiny dendrite specks of hematite, with some shreds and laths of brown biotite.	Widespread green mottling; biotite intergrowths.	22	2,789	100	0	0	E-1 (9)	0	10	<5
Do	do	do	Washer	do	15	do	do	5	41	100	0	0		0	0	15
Big Terrapin mine.	do	Jackson, N. C.	6, 7	Brownish olive	Trace	Rare hematite dendrite specks.	Rare tiny brown bursts.	1	86	100	0	0		0	0	0
Biggerstaff (Deadman) mine.	Shelby-Hickory	Lincoln, N. C.	5½, 6, 7	Pinkish buff, with streaks of pale yellowish olive.	5	Sparse magnetite spots and specks.	Clay-stained; rare brown bursts.	3	305	100	0	0	E-1 (2)	0	0	0
Do	do	do	Washer	do	10	do	do	1	9	100	0	0				
Birch mine	Spruce Pine	Mitchell, N. C.	4, 5, 5½, 6, 7.	Brownish olive	Trace	Rare magnetite specks.		7	679	100	0	0	E-1 (4)	Trace	Trace	Trace
Do	do	do	Washer	do	Trace	do		1	7	100	0	0				
Bittner and Beech mine.	do	Yancey, N. C.	do	do	Trace	Rare magnetite specks.	Slightly clay-stained.	1	15	100	0	0		0	0	0
Black Dixie mine (in Bailey Mountain group).	do	do	6, 7	do	95	Abundant dendrite spots and blotches of hematite, many with trigonal pattern.		2	136	100	0	0	E-1 (1)	20	0	70
Do	do	do	Washer	do	0	do		1	12	58	42	0				

Blackjack mine	Franklin-Sylva	Jackson, N. C.	do	Cinnamon brown	0		Pale curdy brown stain.	1	15	100	0	0		0		0
Blake (Boomer Tom Young) mine.	Spruce Pine	Yancey, N. C.	5, 6, 7	Brownish olive with a little very pale cinnamon brown.	25	Scattered dendrite spots of hematite.	Local pale-green wisps of biotite(?).	3	190	100	0	0	E-1 (2)	0	0	0
Do.	do	do	Washer	do	5	do	do	1	15	100	0	0				
Blanton prospect	Franklin-Sylva	Jackson, N. C.	6, 7	Pale cinnamon brown.	5	Scattered magnetite specks and spots.	Clay-stained; sparse brown dendrite spots.	1	52	100	0	0		0	0	0
Do.	do	do	Washer	do	100	do	do	1	8	0	100	0				
Blanton prospect (near Tom Cabaniss mine).	Shelby-Hickory	Cleveland, N. C.	6, 7	Cinnamon brown.	Trace	Rare magnetite specks.	Clay-and iron-stained.	2	138	100	0	0		0	0	0
Do.	do	do	Washer	do	Trace	do	do	1	18	100	0	0				
Blanton, C. Robbert, mine.	do	do	6, 7	Cinnamon brown, with pale-greenish streaks.	<5	Sparse magnetite specks.	Clay-stained	1	68	100	0	0	E-1 (1)	0	0	10
Do.	do	do	Washer	do	50	do	do	1	8	100	0	0				
Blanton, Cliff, mine.	do	do	6, 7	Cinnamon brown, with some streaks of light yellowish olive.	10	Rare magnetite spots and specks.	Clay-and iron-stained; local curdy green stain.	8	481	100	0	0	E-1 (3)	0	0	0
Do.	do	do	Washer	do	35	do	do	7	81	94	6	0		0	0	0
Blanton, Coleman, mine.	do	do	5, 6, 7	Pinkish buff, with streaks of light yellowish olive.	Trace	Rare magnetite specks; scattered shreds of green biotite.	Clay-stained; local green mottling.	3	205	100	0	0		0	0	0
Blanton, Troy, mine.	Outlying South Carolina.	Cherokee, S. C.	7	Cinnamon brown with green streaks.	10	Rows of magnetite spots and laths.	Clay-stained	1	97	100	0	0		0	0	0
Blevins, D. O.,-Wes Thomas mine (in Zeph Young group).	Spruce Pine	Yancey, N. C.	3, 4, 5, 6	Yellowish to brownish olive.	15	Rare hematite dendrite specks and abundant shreds of green biotite (?) and altered hematite (?).	Slightly clay-stained; heavy green vegetable stain, locally in rectangular lattices.	5	216	100	0	0	E-1 (4)	0	0	<5
Do.	do	do	Washer	do	5	do	do	2	22	100	0	0				
Bloodworth mine	do	Mitchell, N. C.	do	Brownish olive	50	Scattered dendrite specks and pale triangular lattices of hematite.	Slightly clay-stained.	1	11	100	0	0		0	0	0
Bluff mine	do	Avery, N. C.	6, 7	Yellowish green to cinnamon brown.	Trace	Rare magnetite specks.		1	92	100	0	0		0	0	0
Bolding mine	Outlying South Carolina.	Pickens, S. C.	6, 7	Cinnamon brown with greenish streaks.	0		Intergrowths of biotite.	1	21	100	0	0		0	0	0
Bonnett Split (Big Hill) mine.	Shelby-Hickory	Cleveland, N. C.	6, 7	Pinkish buff	0		Slightly clay-stained.	2	122	100	0	0		0	0	0
Boone, Nelson, mine.	Spruce Pine	Yancey, N. C.	Washer	Light yellowish to brownish olive, with tinges of light brown.	50	Broad rows of magnetite specks and spots.	do	1	7	0	100	0				
Boone, W. K., prospect.	do	do	6, 7	Brownish olive, with tinges of cinnamon brown.	Trace	Rare dendrite specks of hematite.	Clay-stained; sparse pale vegetable stain.	2	168	100	0	0	E-1 (1)	0	0	0
Do.	do	do	Washer	do	Trace	do	do	1	5	100	0	0				
Bowen mine	Shelby-Hickory	Cleveland, N. C.	7	Pinkish buff to cinnamon brown, with pale-greenish streaks.	20	Sparse magnetite specks and small spots.	Clay- and iron-stained.	1	55	100	0	0		0	0	0
Bowen mine, prospect east of.	do	do	6, 7	Cinnamon brown and yellowish green.	Trace	Rare iron oxide specks.	Clay-stained	1	84	100	0	0	E-1 (1)	0	0	0
Do.	do	do	Washer	do	20	do	do	1	9	100	0	0				
Boyt mine	Thomaston-Barnesville.	Upson, Ga.	6	Pale cinnamon brown.	15	Locally abundant biotite plates and very thin hematite spots.	Clay-stained; apatite and biotite inclusions; rare brown bursts.	1	16	100	0	0		0	0	0
Do.	do	do	Washer	do	100	do	do	1	7	100	0	0				

TABLE 10.—*General test data for mica specimens, arranged by lot and by mine or prospect*—Continued

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Type of mineral stain	Remarks	Electrical tests: Number of lots tested	Total number of pieces tested	Percent E-1	Percent E-2	Percent E-3	30-mil stack (number of stacks in parentheses)	Proportion of tested defects (to nearest 5 percent): Material with conducting substances	Material with cracks	Material with pinholes
Bradley-Campbell (Campbell, Higdon) mine.	Franklin-Sylva	Macon, N. C.	5, 6	Pale cinnamon brown to pinkish buff, with streaks of brownish olive.	0		Green mottling; rare pale-to dark-green spots; biotite intergrowths.	3	313	100	0	0	E-1(2)	0	0	0
Do	do	do	Washer	do	0		do	3	22	100	0	0				
Branch mine	Spruce Pine	Avery, N. C.	6, 7	Brownish olive	75	Abundant hematite dendrite specks and faint triangular lattices.		1	11	100	0	0	E-1 (1)	0	0	0
Branch mine	do	Yancey, N. C.	6	do	50	Scattered dendrite spots and specks of hematite.	Pale-green blotches and wisps.	1	19	100	0	0	E-1 (1)	0	0	0
Brawley mine	Franklin-Sylva	Macon, N. C.	6	Yellowish green and brownish olive.	50	Scattered blotches of hematite.		1	37	100	0	0		25	0	0
Do	do	do	Washer	do	50	do		1	15	100	0	0				
Bridges, Pleaz, mine.	Shelby-Hickory	Cleveland, N. C.	6, 7	Cinnamon brown.	Trace	Rare magnetite and hematite specks and small spots.	Clay-and iron-stained.	3	261	100	0	0	E-1 (2)	0	0	0
Do	do	do	6, 7	Yellowish olive	40	Rows of magnetite spots and laths.	do									
Do	do	do	Washer	Cinnamon brown.	20	Rare magnetite and hematite specks and small spots.	do	1	5	100	0	0				
Do	do	do	do	Yellowish olive		Rows of magnetite spots and laths.	do									
Brittan, Floyd, mine.	do	Burke, N. C.	5, 6	Pinkish buff with tinges of cinnamon brown and yellowish olive.	Trace	Rare dendrite spots of hematite.	Clay-stained; much green mottling; local rows of dark-green dendrite laths.	1	70	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	<5	do	do	1	12	100	0	0				
Broomfield prospect.	Outlying Virginia.	Pittsylvania, Va.	5, 6	Light yellowish olive.	0		Very heavily clay-stained and moderately iron-stained.	2	209	100	0	0		0	0	0
Brown mine	Ridgeway-Sandy Ridge.	Stokes, N. C.	5½, 6	Pinkish buff to cinnamon brown.	15	Scattered shreds and wisps of brown biotite.	Clay-and iron-stained.	1	133	100	0	0		0	0	0
Brown (Parrish) mine.	Thomaston-Barnesville.	Upson, Ga.	4, 5, 5½, 6, 7.	Pinkish buff	Trace	Rare magnetite and hematite specks.	Clay-and iron-stained; some rows of thin biotite wisps.	3	480	100	0	0	E-1 (1)	0	0	3
Brown Creek mine.	Spruce Pine	Yancey, N. C.	6	Brownish olive to light brown.	0			1	51	100	0	0	E-1 (1)	0	0	0
Brushy Creek East mine.	do	Avery, N. C.	Washer	Brownish olive	50	Rare shreds and plates of biotite.	Clay-stained	1	8	100	0	0		0	0	0
Bryson mine	Franklin-Sylva	Jackson, N. C.	do	Yellowish olive, with some pale brown.	Trace	Rare black iron oxide spots.	Slightly clay-stained.	1	18	100	0	0				
Bryson prospects	do	Macon, N. C.	6, 7	Light cinnamon brown with many pale streaks.	10	Rare magnetite specks.	Clay-stained	2	262	100	0	0	E-1 (1)	0	5	0
Bryson, C. D., mine.	do	Jackson, N. C.	6, 7	Light cinnamon brown.	0		Clay-and iron-stained.	1	17	100	0	0		0	0	0

Bryson, C.V., mine.	do	do	Washer	Pale cinnamon brown.	0		Clay-and iron-stained; rare pale-green mottling.	1	8	100	0	0		0		0
Bryson, Diller, mine.	do	do	do	Light cinnamon brown.	0		Clay-stained	1	8	100	0	0		0	0	0
Bryson, Terrell, (Old Bryson) mine.	do	Macon, N. C.	6, 7	Pale cinnamon brown with broad areas and streaks of light yellowish olive.	Trace	Rare rows of black iron oxide specks.	Slightly clay-stained; groups of dark-green to brown bursts at centers of some books.	3	612	100	0	0	E-1 (3)	0	0	0
Do.	do	do	Washer	do	Trace	do	do	2	9	100	0	0				
Buchanan, Aaron, mine.	Spruce Pine	Avery, N. C.	6	Brownish olive to brown.	0			1	32	100	0	0	E-1 (1)	0	0	0
Buchanan, Adam, mine.	do	Mitchell, N. C.	6, 7	Brownish olive.	100	Hematite dendrite specks and spots; many thin, curdy brown lattices.	Local pale vegetable stain.	1	17	100	0	0		0	0	0
Buchanan, B.C., prospects.	Franklin-Sylva	Jackson, N. C.	6	Cinnamon brown with streaks of yellowish olive.	50	Scattered magnetite specks.	Clay-stained	1	57	100	0	0		0	0	0
Do.	do	do	Washer	do	50	do	do	1	15	100	0	0				
Buchanan, Franklin, (Lee Cook) mine.	Spruce Pine	Avery, N. C.	5, 6	Yellowish olive.	10	Sparse specks of magnetite.	Rare dark-brown dendrite specks.	1	42	100	0	0	E-1 (1)	0	0	0
Do.	do	do	Washer	do	20	do	do	1	9	100	0	0				
Buchanan, Henry, prospects.	Franklin-Sylva	Jackson, N. C.	do	Pale cinnamon brown.	35	Sparse magnetite specks and spots, with some hematite specks.	Heavily clay- and iron-stained.	2	17	53	29	18		0	0	0
Buchanan, J. K., (Milt Wilson, Erby Buchanan) mine.	Spruce Pine	Mitchell, N. C.	3, 4, 5, 6, 7.	Pinkish buff to cinnamon brown with some greenish streaks.	Trace	Rare magnetite specks.	Clay-and iron-stained.	6	525	100	0	0	E-1 (3)	0	0	15
Do.	do	do	Washer	do	Trace	do	do	1	15	100	0	0				
Buchanan, Jim, mine.	do	do	do	Yellowish olive.	100	Rare dendrite specks of hematite.	Slightly clay-stained; garnet inclusions.	1	14	100	0	0		0	0	75
Buchanan, Jim, prospect.	do	do	do	Deep yellowish green.	25	Sparse hematite spots and specks.	Minor light-brown mottling; slightly clay-stained.	1	9	0	100	0		0	0	10
Buchanan, Marsden, prospect.	Franklin-Sylva	Jackson, N. C.	do	Pale cinnamon brown.	0		Clay-stained; rare brown dendrite spots.	1	7	100	0	0		0		50
Buchanan, Pole, mine.	do	do	6	Light cinnamon brown.	Trace	Rare magnetite specks.	Clay-stained	1	95	100	0	0		0	0	0
Buchanan, Ramsey, mine.	do	do	Washer	Cinnamon brown.	0		Clay-and iron-stained; local greenish mottling.	1	7	100	0	0		0	0	0
Buck Hill Rock mine.	Spruce Pine	Avery, N. C.	5, 5½, 6, 7.	Yellowish to brownish olive.	5	Closely spaced hematite specks, highly dendritic.	Slightly clay-stained; much pale-green mottling.	4	518	100	0	0	E-1 (3)	<5	<5	Trace
Do.	do	do	Washer	do	100	do	do	1	11	100	0	0				
Buck Knob mine.	Franklin-Sylva	Jackson, N. C.	6, 7	Pale brownish olive.	10	Very rare magnetite specks.	Clay-stained	1	74	100	0	0		0	0	0
Buck Mountain mine.	Jefferson-Boone	Ashe, N. C.	5½, 6, 7	Yellowish olive and cinnamon brown.	Trace	Rare dendrite specks of hematite.	Clay-stained; rare tiny brown bursts.	5	576	100	0	0	E-1 (3)	Trace	Trace	<5
Buckeye mine	Spruce Pine	Mitchell, N. C.	4, 5	Pale yellowish green.	0			1	32	100	0	0	E-1 (1)	0	0	0
Buckeye mine (on Crabtree Creek).	do	Yancey, N. C.	5, 6	Yellowish to light brownish olive.	20	Scattered dendrite spots of hematite.	Slightly clay- and iron-stained.	1	16	100	0	0		0	0	0
Buckeye mine (west of Boonford).	do	do	5, 6	Brown to brownish olive.	5	Dendrite spots of hematite; some faint triangular lattices.	Slightly clay-stained.	2	24	100	0	0	E-1 (2)	0	0	0
Buckeye Gap mine.	Franklin-Sylva	Jackson, N. C.	6	Yellowish olive.	100	Magnetite spots and hematite dendrites, some in triangular lattices.	Clay-stained; pale vegetable stain.	1	51	100	0	0		75	0	0
Do.	do	do	Washer	do	100	do	do	1	8	100	0	0				

TABLE 10.—*General test data for mica specimens, arranged by lot and by mine or prospect*—Continued

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Type of mineral stain	Remarks	Electrical tests								
								Number of lots tested	Total number of pieces tested	Percent E-1	Percent E-2	Percent E-3	30-mil stack (number of stacks in parentheses)	Proportion of tested defects (to nearest 5 percent)		
														Material with conducting substances	Material with cracks	Material with pinholes
Bug Rock (Westphalen) mine.	Spruce Pine	Avery, N. C.	Washer	Cinnamon brown.	0		Slightly clay-stained.	1	7	100	0	0		0	0	0
Bumgarner mine.	Franklin-Sylva	Jackson, N. C.	6	Brownish olive.	0		Clay-stained.	1	73	100	0	0	E-1 (1)	0	0	0
Bumgarner mine.	Shelby-Hickory	Cleveland, N. C.	6, 7	Pinkish buff with pale-greenish streaks.	15	Rare dendrite specks of hematite and specks of magnetite.	Slightly clay-stained.	2	156	100	0	0	E-1 (2)	0	0	0
Bunker Hill mine.	Spruce Pine	Mitchell, N. C.	5	Yellowish olive.	Trace	Very rare magnetite specks.		1	28	100	0	0		0	0	0
Buoy No. 1 mine.	Franklin-Sylva	Macon, N. C.	4, 5, 6, 7	Dull yellowish olive and dark brown to cinnamon brown.	Trace	Rare rows of magnetite specks and spots; scattered dendrite spots of hematite.	Slightly clay-, iron-, and manganese-stained; curdy brown stain in centers of some books; rare dark-brown dendrite spots and specks; local pale-green vegetable stain; scattered zircon inclusions.	10	1,820	100	0	0	E-1 (7)	0	5	5
Do.	do.	do.	Washer	do.	<5	do.	do.	3	41	100	0	0				
Buoy No. 2 mine.	do.	do.	6, 7	Cinnamon brown and pale yellowish green to brownish olive; much color zoning.	25	Rare scattered magnetite spots and some broad belts of such spots.	Some greenish mottling.	2	171	100	0	0	E-1 (1)	0	0	0
Do.	do.	do.	Washer	do.	20	do.	do.	2	33	100	0	0		0	0	75
Burco mine	Buncombe	Buncombe, N. C.	6, 7	Cinnamon brown.	10	Rare specks and spots of magnetite and hematite.	Clay- and iron-stained; pale-green mottling; local green dendrite laths.	1	125	100	0	0	E-1 (1)	0	0	20
Do.	do.	do.	Washer	do.	35	do.	do.	1	9	100	0	0				
Burgess (L. E. Hunter) mine.	Outlying South Carolina.	Anderson, S. C.	6	Cinnamon brown and yellowish olive in color-zoned books.	15	Scattered biotite flakes and rare magnetite specks.	Clay-stained; green and brown bursts.	1	23	100	0	0	E-1 (1)	10	0	<5
Do.	do.	do.	Washer	do.	50	do.	do.	1	8	100	0	0				
Burke, John, (Barnard) mine.	Franklin-Sylva	Macon, N. C.	6	Light cinnamon brown with pale-greenish streaks.	0		Clay-stained; rare greenish mottling.	1	12	100	0	0		0	0	0
Burleson, Charley, mine.	Spruce Pine	Avery, N. C.	5, 6	Cinnamon brown.	<5	Plates and shreds of biotite, with rare hematite dendrite spots near centers of some books.	Slightly clay-stained; apatite inclusions.	1	22	100	0	0		0	0	0
Do.	do.	do.	Washer	do.	55	do.	do.	1	17	100	0	0		0	0	0
Burleson, John, mine.	Franklin-Sylva	Macon, N. C.	5, 6, 7	Pale pinkish buff and pale yellowish olive.	Trace	Rare black iron oxide specks.	Clay- and iron-stained; some vegetable stain and green mottling; rare small green bursts;	4	745	100	0	0	E-1 (4)	0	0	5

							biotite intergrowths in some buff books.									
Do	do	do	Washer	do	Trace	do	do	2	32	100	0	0				
Burleson, W. C., (Joe Stevenson) mine.	Spruce Pine	Mitchell, N. C.	5, 5½, 6, 7.	Cinnamon brown.	Trace	Rare magnetite specks and spots.	Slightly clay-stained; local green dendrite specks.	9	933	100	0	0	E-1 (5)	Trace	Trace	<5
Do	do	do	Washer	do	Trace	do	do									
Do	do	do	5, 5½, 6, 7.	Rare light yellowish green.	Trace	Sparse dendrite specks of hematite.	Slightly clay-stained; local curdy greenish stain.	5	42	100	0	0		0	0	0
Do	do	do	Washer	do	5	do	do									
Burr Knob (Bryson) mine.	Franklin-Sylva	Macon, N. C.	6	Cinnamon brown.	0		Clay-stained; sparse brown dendrite specks.	2	137	100	0	0		0	0	0
Do	do	do	Washer	do	0		do	1	12	100	0	0		0	0	0
Butler mine	Wilkes	Caldwell, N. C.	5, 6, 7	Dark yellow green.	15	Scattered dendrite spots and blotches of hematite.	Slightly clay-stained; garnet inclusions.	3	277	100	0	0	E-1 (2)	0	0	0
Do	do	do	Washer	do	80	do	do	1	15	100	0	0				
Buttermilk mine.	Franklin-Sylva	Macon, N. C.	6	Pale brownish olive and cinnamon brown.	0			1	71	100	0	0		0	0	0
Buzzard Roost mine.	do	Jackson, N. C.	5, 6	Deep brownish olive.	0		Rows of brown dendrite specks.	1	76	100	0	0	E-1 (1)	0	0	0
Byrd, Jeff, (Byrd) mine.	Spruce Pine	Mitchell, N. C.	6	Cinnamon brown.	0		Reddish-brown bursts.	1	23	100	0	0		0	0	0
Do	do	do	Washer	do	0		do	1	15	100	0	0				
"C" (Puncheon Camp) mine.	Franklin-Sylva	Jackson, N. C.	5, 6	Cinnamon brown and yellowish olive.	5	Sparse brown to black iron oxide specks.	Faint brownish mottling; rare dendrite specks.	1	34	100	0	0	E-1 (1)	0	0	0
Cabaniss prospect.	Shelby-Hickory	Cleveland, N. C.	6, 7	Pinkish buff, with pale-greenish streaks.	0		Clay- and iron-stained.	2	224	100	0	0		0	0	0
Do	do	do	Washer	do	0		do	1	14	100	0	0				
Cabaniss, Alma, mine.	do	do	6	do	40	Rare hematite dendrite specks.	do	1	20	100	0	0		0	0	0
Cabaniss, Tom, mine.	do	do	5, 6, 7	Pinkish buff and light yellowish green.	15	Sparse magnetite specks; most in green parts of books.	Clay- and iron-stained; garnet inclusions.	4	538	100	0	0	E-1 (2)	0	0	Trace
Do	do	do	Washer	do	80	do	do	1	18	100	0	0				
Cabe mine	Franklin-Sylva	Jackson, N. C.	do	Cinnamon brown.	Trace	Rare hematite specks.	Clay- and iron-stained.	1	8	100	0	0		0	0	0
Camp Branch prospect.	do	Macon, N. C.	5, 6, 7	Dull yellowish olive.	0		Clay-stained	1	76	100	0	0	E-1 (1)	0	0	0
Campbell mine	Shelby-Hickory	Cleveland, N. C.	6	Cinnamon brown, with pale-greenish streaks.	20	Sparse dendrite specks and spots of hematite; rare magnetite.	do	1	89	40	60	0		0	0	0
Do	do	do	Washer		100	do	do	1	7	0	100	0		0	0	0
Carolina China Clay Co. mine.	Spruce Pine	Mitchell, N. C.	6, 7	Brownish olive	10	Scattered dendrite specks of hematite.	Local pale-green mottling.	1	42	100	0	0		0	0	0
Carolina Mineral Co. No. 3 mine.	do	do	7	Dark yellowish olive.	100	Scattered specks and dendrite spots of hematite; minor lattices.		1	13	100	0	0		0	0	0
Carolina Mineral Co. No. 6 mine.	do	do	6	Yellowish olive	20	Sparse hematite dendrite specks, with local, very thin lattices.		1	14	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	100	do		1	18	0	0	100		0	0	0
Carolina Mineral Co. No. 12 mine.	do	do	do	Brownish olive	10	Sparse hematite dendrite specks and spots.		1	17	100	0	0		0	0	25
Carolina Mineral Co. No. 12 (White) prospect.	do	do	6, 7	Yellowish to brownish olive.	10	Rare dendrite spots and specks of hematite.	Garnet inclusions.	1	18	100	0	0		0	0	0
Carolina Mineral Co. No. 20 mine.	do	Yancey, N. C.	5, 6, 7	Yellowish olive and deep yellowish olive to brownish olive.	20	Scattered dendrite specks and very thin wisps of hematite.	Sparse light-brown dendrite specks.	6	760	100	0	0	E-1 (3)	0	0	0

TABLE 10.—*General test data for mica specimens, arranged by lot and by mine or prospect*—Continued

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Type of mineral stain	Remarks	Electrical tests: Number of lots tested	Total number of pieces tested	Percent E-1	Percent E-2	Percent E-3	30-mil stack (number of stacks in parentheses)	Proportion of tested defects (to nearest 5 percent): Material with conducting substances	Material with cracks	Material with pinholes
Carolina Mineral Co. No. 29 mine.	Spruce Pine	Mitchell, N. C.	Washer	Yellowish to brownish olive.	100	Dendrite spots and triangular lattices of hematite.	Garnet inclusions.	1	11	100	0	0		0	0	0
Carpenter mine	Shelby-Hickory	Cleveland, N. C.	6, 7	Yellowish olive	75	Scattered magnetite specks, spots, and laths.	Clay-stained	2	163	100	0	0	E-1 (1)	0	0	0
Carpenter, Tom, mine.	Spruce Pine	Avery, N. C.	6	Cinnamon brown	<5	Rare dendrite specks of hematite.	Rare brown bursts.	1	19	100	0	0	E-1 (1)	0	0	0
Carter mine	Hartwell	Hart, Ga.	6	Cinnamon brown with pale-greenish streaks.	10	Rare magnetite spots and specks.	Slightly clay-stained; some thin biotite intergrowths.	1	73	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	55	do	do	1	7	100	0	0				
Carter mine	Thomaston-Barnesville.	Upson, Ga.	3, 4, 5, 5½, 6, 7.	Yellowish olive and pale cinnamon brown.	0		Clay- and iron-stained; local vegetable stain.	3	559	100	0	0	E-1 (3)	0	0	5
Carters Ridge prospect.	Spruce Pine	Mitchell, N. C.	do	Green	0		Heavily clay- and iron-stained.	1	12	100	0	0		0	0	0
Carson Rock mine	do	Yancey, N. C.	5	Light cinnamon brown.	Trace	Rare magnetite specks.		1	13	100	0	0	E-1 (1)	0	0	0
Case mine	do	Mitchell, N. C.	Washer	Yellowish olive	100	Many dendrite spots of hematite.	Clay-stained; garnet inclusions.	2	16	56	44	0		0	0	Trace
Do	do	do	do	Green	0		do									
Cattail (Cattail Creek, Ison) mine.	do	Yancey, N. C.	4, 5, 6	Brownish olive	Trace	Rare magnetite specks.	Slightly clay- and iron-stained; rows of green dendrite specks; rare brown bursts; local pale-green shreds.	3	211	100	0	0	E-1 (3)	0	0	5
Do	do	do	Washer	do	Trace	do	do	2	15	100	0	0				
Cedar Cliff mine	Franklin-Sylva	Jackson, N. C.	6	Cinnamon brown with pale-greenish streaks.	0		Slightly clay-stained: rare tiny brown bursts.	1	26	100	0	0		0	0	0
Do	do	do	Washer	do	0		do	1	5	100	0	0				
Chalk Hill mine	do	Macon, N. C.	4, 5, 6	Light cinnamon brown.	0		Rare small brown bursts and dendrite spots.	3	503	100	0	0	E-1 (1)	0	0	45
Do	do	do	Washer	do	0		do	2	40	100	0	0				
Chalk Mountain mine.	Spruce Pine	Mitchell N. C.	5½, 6	Yellowish olive	50	Dendrite specks, spots, and very thin lattices of hematite.		1	14	100	0	0		0	0	0
Chalk Mountain prospect.	do	do	Washer	do	0		Clay-stained	1	11	45	55	0		0		0
Chalk Mountain Northeast prospect.	do	do	do	Green	0		do	1	8	100	0	0		0	0	0
Chalk Mountain Road, dump near.	do	do	6	do	0			1	42	100	0	0		0	0	0

Champion (Jefferson No. 4, Bland) mine.	Amelia	Amelia, Va.	5, 5½, 6, 7.	Light brownish olive to cinnamon brown.	Trace	Sparse magnetite specks and spots, with locally abundant biotite shreds.	do	6	963	100	0	0	E-1 (3)	5	0	15
Do	do	do	Washer	do	100	do	do	1	9	100	0	0				
Champion Fibre Co. prospect.	Franklin-Sylva	Haywood, N. C.	6	Cinnamon brown, with streaks of pale yellowish olive.	0	Scattered magnetite specks.	Clay- and iron-stained.	1	38	100	0	0		0	0	0
Do	do	do	Washer	do	100	do	do	1	11	100	0	0				
Charlies Ridge mine.	Spruce Pine	Avery, N. C.	2, 4, 5, 5½, 6, 7.	Green to light yellowish olive.	0		Clay-stained	7	715	100	0	0	E-1 (6)	0	0	10
Do	do	do	Washer	do	0		do	2	20	100	0	0				
Chestnut Branch mine.	do	Yancey, N. C.	6	Cinnamon brown	30	Magnetite spots and specks, with some dendrite specks of hematite.	Slightly clay-stained.	1	38	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	40	do	do	1	5	100	0	0				
Chestnut Flat mine.	do	Mitchell, N. C.	5, 6, 7	Brownish to dark yellowish olive.	65	Scattered dendrite specks and spots of hematite, with rectangular lattices of altered hematite; large magnetite spots.	Slightly clay-stained; heavy vegetable stain.	3	140	100	0	0		0	0	0
Do	do	do	Washer	do	55	do	do	2	24	100	0	0				
Chestnut Flat prospect.	do	do	6	Light brownish olive to cinnamon brown.	20	Rare hematite specks.	Rectangular lattices of curdy brown stain.	1	15	100	0	0		0	0	0
Chestnut Flats mine.	do	do	6	Yellowish olive	Trace	Sparse magnetite spots.	Clay-stained	1	42	100	0	0		0	0	0
Do	do	do	Washer	do	60	do	do	1	5	100	0	0				
Choga (Chogey) mine.	Franklin-Sylva	Jackson, N. C.	do	Pale cinnamon brown.	Trace	Rare magnetite specks.	Clay-stained; rare brown bursts.	1	15	100	0	0		0	0	0
Chrysolite mine	Shelby-Hickory	Cleveland, N. C.	6, 7	Cinnamon brown	10	Scattered flakes and wisps of biotite.	Slightly clay-stained.	1	265	100	0	0	E-1 (1)	0	0	0
Cilley (Silly, Celia) mine group.	Spruce Pine	Yancey, N. C.	5, 6, 7	Brownish olive, with some yellowish olive.	10	Brown to black dendrite specks and spots of hematite, especially in more yellowish books.	Slightly clay-stained; abundant pale-green mottling.	4	409	100	0	0	E-1 (2)	0	0	0
Do	do	do	Washer	do	40	do	do	3	29	100	0	0				
Clarissa mine	do	Mitchell, N. C.	6	Cinnamon brown	Trace	Sparse hematite and magnetite specks and small spots.		1	70	100	0	0	E-1 (1)	0	0	0
Clark, Hardy, prospect.	Franklin-Sylva	Jackson, N. C.	Washer	Pale cinnamon brown.	0		Clay- and iron-stained.	1	18	100	0	0		0	0	20
Cloudland (Pizsel) mine.	Spruce Pine	Mitchell, N. C.	4, 5, 5½, 6, 7.	Cinnamon brown.	<5	Broad rows of magnetite spots and large laths; rare hematite dendrite spots and specks.	Slightly clay-stained.	7	737	100	0	0	E-1 (5)	Trace	10	5
Clouse mine	Franklin-Sylva	Jackson, N. C.	6	Deep brownish olive.	0		Pale-green mottling; sparse brown specks.	1	76	100	0	0	E-1 (1)	0	0	0
Coggins prospect	Thomaston-Barnesville.	Lamar, Ga.	6	Pinkish buff, with pale-greenish tinges.	5	Rare magnetite specks.	Clay-stained; some green mottling.	1	105	100	0	0		0	0	0
Coleman No. 2 mine.	Ridgeway-Sandy Ridge.	Henry, Va.	6, 7	Yellowish to brownish olive.	Trace	Scattered hematite dendrite specks.	Slightly clay-stained.	2	88	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	20	do	do	1	8	100	0	0				
Collins mine	Franklin-Sylva	Jackson, N. C.	do	Light cinnamon brown with many streaks of dull yellowish olive.	10	Broad belts of magnetite spots.	Slightly clay-stained; local faint vegetable stain.	1	17	100	0	0		0	0	0
Collum (McCray) mine.	Alabama	Tallapoosa, Ala.	6, 7	Yellowish olive to cinnamon brown.	65	Scattered hematite dendrite specks, spots, and blotches.	Clay- and iron-stained; much vegetable stain; dark-green bursts.	5	998	100	0	0	E-1 (5)	0	0	10
Do	do	do	Washer	do	100	do	do	1	8	100	0	0				

TABLE 10.—*General test data for mica specimens, arranged by lot and by mine or prospect*—Continued

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Type of mineral stain	Remarks	Electrical tests: Number of lots tested	Total number of pieces tested	Percent E-1	Percent E-2	Percent E-3	30-mil stack (number of stacks in parentheses)	Proportion of tested defects (to nearest 5 percent): Material with conducting substances	Material with cracks	Material with pinholes
Collum "Quartz-Blowout" deposit.	Alabama	Tallapoosa, Ala.	5, 6, 7	Yellowish olive	100	Scattered hematite specks; widespread curdy green stain in rectangular pattern.	Clay-stained	2	324	100	0	0	E-1 (2)	0	0	5
Do	do	do	Washer	do	100	do	do	1	13	100	0	0				
Commissary Ridge mine.	Spruce Pine	Yancey, N. C.	5	do	0			1	41	100	0	0	E-1 (1)	0	0	0
Cook mine	do	Mitchell, N. C.	6	Brownish olive	Trace	Rare dendrite specks of hematite.	Slightly clay-stained.	1	35	100	0	0		0	0	0
Do	do	do	Washer	do	50	do	do	1	6	6	0	0				
Cook prospect	do	do	6	do	Trace	Rare dendrite specks of hematite.		1	16	100	0	0		0	0	0
Do	do	do	Washer	do	10	do		1	11	100	0	0				
Cooke mine	Shelby-Hickory	Cleveland, N. C.	6, 7	Cinnamon brown.	<5	Sparse magnetite specks.	Clay-stained	1	20	100	0	0		0	0	5
Cooley mine	Hartwell	Elbert, Ga.	5, 6, 7	Yellowish green and light cinnamon brown.	Trace	Rare spots and specks of magnetite.	do	3	215	100	0	0	E-1 (2)	0	0	0
Do	do	do	Washer	do	40	do	do	2	18	100	0	0				
Cora mine (large SW. rock pit).	Spruce Pine	Yancey, N. C.	do	Brownish olive	<5	Scattered specks and dendrite spots of hematite.	Rare green dendrite specks.	1	9	100	0	0				
Cora mine (small SW. rock pit).	do	do	6	do	<5	Scattered spots and specks of hematite.	Slightly clay-stained.	1	53	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	<5	do	do	1	7	100	0	0				
Corbin Knob mine.	Franklin-Sylva	Macon, N. C.	6	Very pale cinnamon brown.	<5	Scattered black iron oxide specks.	Clay-stained	1	36	100	0	0		0	0	0
Do	do	do	Washer	do	<5	do	do	1	8	100	0	0				
Corbin Knob prospects.	do	do	do	Cinnamon brown.	0		do	1	9	100	0	0		0	0	0
Corley mine	Thomaston-Barnesville.	Upson, Ga.	6	Pinkish buff	20	Sparse dendrite specks of hematite.	do	1	23	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	40	do	do	1	22	100	0	0				
Corn mine	Spruce Pine	Avery, N. C.	3, 4, 5, 6, 7.	Dark brown to brownish olive.	65	Scattered dendrite spots and blotches of hematite with local lattices.	Slightly clay-stained.	5	842	98	0	2	E-1 (1)	25	0	0
Do	do	do	Washer	do	100	do	do	2	21	100	0	0				
Corner Rock mine.	Buncombe	Buncombe, N. C.	6, 7	Cinnamon brown.	30	Scattered spots and specks of hematite and magnetite, with shreds of brown biotite.	Slightly clay-stained; biotite intergrowths; local small brown bursts.	1	139	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	100	do	do	1	9	100	0	0				
Cornwall, Frank, (Old J. S. Blanton) mine.	Shelby-Hickory	Cleveland, N. C.	6	Light cinnamon brown.	Trace	Rare specks and spots of magnetite and hematite.	Clay-stained	2	133	100	0	0	E-1 (2)	0	0	0
Do	do	do	Washer	do	<5	do	do	2	24	100	0	0				
Cornwell, Charles, prospect.	do	do	6, 7	Cinnamon brown.	0		do	1	132	100	0	0	E-1 (1)	0	0	<5
Cow Camp South mine.	Spruce Pine	Avery, N. C.	6, 7	Pale cinnamon brown.	Trace	Rare hematite specks.	Slightly clay-stained.	1	75	100	0	0		0	0	0
Do	do	do	Washer	do	50	do	do	1	14	100	0	0				

Cowpens mine	Outlying South Carolina.	Spartanburg, S. C.	6	Light cinnamon brown with greenish streaks.	30	Rows of magnetite specks and spots.	Clay-stained	1	92	100	0	0		0	0	0
Cox (Cox and Davies) mine.	Franklin-Sylva	Jackson, N. C.	5, 6	Cinnamon brown.	0		Rare brown specks.	1	22	100	0	0	E-1 (1)	0	0	0
Cox prospect	Spruce Pine	Mitchell, N. C.	6	Green	Trace	Rare specks of magnetite and hematite.	Garnet inclusions.	1	37	100	0	0		0	0	0
Do	do	do	Washer	do	Trace	do	do	1	17	100	0	0				
Cox, Ben, mine	do	do	6	Cinnamon brown.	100	Dendrite specks and spots of hematite near centers of books.	Clay-stained	1	65	100	0	0		0	0	0
Do	do	do	Washer	do	100	do	do	1	7	100	0	0				
Cox, Wood, mine	do	do	6	Dark yellowish to brownish olive.	100	Scattered dendrite specks of hematite.	Garnet inclusions.	1	42	100	0	0		0	0	0
Do	do	do	Washer	do	100	do	do	1	8	0	100	0				
Cox, Wood, prospect.	do	do	6	Dark yellowish green.	50	do		1	40	100	0	0	E-1 (1)	0	0	0
Crabtree No. 1 (Wildcat) mine.	do	do	5, 5½, 6, 7.	Yellowish olive to dark yellowish green.	Trace	Rare specks and small spots of hematite.		10	1032	100	0	0	E-1 (5)	Trace	Trace	Trace
Do	do	do	Washer	do	<5	do		5	63	81	19	0				
Crabtree Northwest prospect.	do	do	6	Dark yellowish green.	0		Clay-stained	1	36	100	0	0		0	0	0
Crabtree Summit prospect.	do	do	5, 6	do	100	Dendrite spots and blotches of hematite with many triangular and rectangular lattices.	Slightly clay-stained.	1	6	0	67	33	E-2 (1)	100	0	0
Do	do	do	Washer	do	0	do	do	1	17	100	0	0				
Crawford, Lester, prospect.	Franklin-Sylva	Macon, N. C.	6, 7	Pale cinnamon brown with very pale greenish streaks.	0		Clay-stained	1	121	100	0	0		0	0	0
Crawford-Daniel mine.	Hartwell	Elbert, Ga.	6, 7	Cinnamon brown.	20	Rare magnetite spots.	Clay- and iron-stained.	1	37	100	0	0	E-1 (1)	0	0	10
Do	do	do	Washer	do	55	do	do	1	7	100	0	0				
Creson mine	Spruce Pine	Yancey, N. C.	do	do	<5	Rare hematite dendrite specks.	Clay-stained; curdy brown stain in centers of books that contain hematite specks.	1	7	100	0	0				
Crews No. 1 prospect.	Outlying Virginia.	Charlotte, Va.	5, 6, 7	Yellowish olive	100	Triangular lattices of yellowish, brownish, and black iron oxides.	Clay-stained	1	185	86	3	11		65	0	0
Crews No. 2 prospect.	do	do	6	do	10	Scattered large dendrite spots of hematite.	Slightly clay-stained.	1	121	100	0	0	E-1 (1)	0	0	5
Do	do	do	Washer	do	100	do	do	1	8	100	0	0				
Crews prospects, road cut near.	do	do	6	Yellowish to brownish olive.	100	Sparse dendrite spots of hematite, with much thin small biotite.	Clay-and iron-stained.	1	110	100	0	0		0	0	10
Do	do	do	Washer	do	100	do	do	1	6	100	0	0				
Cunningham mine.	Franklin-Sylva	Macon, N. C.	3, 4	Cinnamon brown with pale brownish-olive streaks.	0		Slightly clay-stained.	2	431	100	0	0		0	0	25
Do	do	do	Washer	do	0		do	1	16	100	0	0		0	0	0
Dagenhart mine	Shelby-Hickory	Alexander, N. C.	6, 7	Pinkish buff	0		Clay-stained; scattered reddish-brown bursts.	1	32	100	0	0		0	0	0
Do	do	do	Washer	do	0		do	1	15	100	0	0				
Dalton mine	Franklin-Sylva	Macon, N. C.	6	Pale cinnamon brown.	0		Slightly iron-stained; rare green to brown dendrite specks.	1	73	100	0	0		0	0	0
Daniels, Cling, mine.	Wilkes	Caldwell, N. C.	4, 5, 6, 7	Yellowish to brownish olive with a few light cinnamon-brown books.	0		Slightly clay-stained; some brown bursts.	3	211	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	0		do	1	12	100	0	0				

TABLE 10.—*General test data for mica specimens, arranged by lot and by mine or prospect*—Continued

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Type of mineral stain	Remarks	Electrical tests: Number of lots tested	Electrical tests: Total number of pieces tested	Electrical tests: Percent E-1	Electrical tests: Percent E-2	Electrical tests: Percent E-3	Electrical tests: 30-mil stack (number of stacks in parentheses)	Proportion of tested defects (to nearest 5 percent): Material with conducting substances	Proportion of tested defects (to nearest 5 percent): Material with cracks	Proportion of tested defects (to nearest 5 percent): Material with pinholes
Dave Ridge mine	Franklin-Sylva	Jackson, N. C.	6	Pale pinkish buff.	0		Clay-stained	1	14	100	0	0	E-1 (1)	0	0	0
Davis mine	Spruce Pine	Mitchell, N. C.	Washer	Yellowish to dark brownish olive with green streaks.	15	Rare dendrite spots of hematite.		2	33	100	0	0		0	0	40
Davis prospect	Franklin-Sylva	Jackson, N. C.	do	Pale brownish olive, with tinges of cinnamon brown.	15	Dendrite specks of hematite at centers of books.	Clay-and iron-stained.	1	17	100	0	0		0	0	0
Davis, Walter, mine.	Shelby-Hickory	Cleveland, N. C.	6, 7	Light cinnamon brown.	0		Slightly clay-stained; local green mottling.	1	97	100	0	0	E-1 (1)	0	0	0
De Shazo mine	Ridgeway-Sandy Ridge.	Henry, Va.	5, 6, 7	Brownish olive, with some light green.	<5	Sparse plates and shreds of biotite; rare spots of hematite.	Slightly clay-stained.	4	281	100	0	0	E-1 (3)	0	0	0
Do	do	do	Washer	do	0	do	do	3	33	100	0	0		0	0	55
Dead Timber Ridge mine.	Franklin-Sylva	Jackson, N. C.	do	Pale cinnamon brown.	0		Local pale-green mottling.	1	17	100	0	0		0	0	0
Deake (Dake) mine.	Spruce Pine	Mitchell, N. C.	5, 5½, 6, 7.	Yellowish to brownish olive.	Trace	Rare specks and small spots of magnetite and, locally, hematite.	Clay-stained; rare brown bursts.	7	537	100	0	0	E-1 (5)	0	0	<5
Do	do	do	Washer	do	<5	do	do	4	38	100	0	0				
Deer Park No. 1 mine.	do	do	4, 5, 5½, 6, 7.	do	Trace	Very rare specks of magnetite and hematite.	Sparse tiny dark-green bursts.	7	761	100	0	0	E-1 (1)	0	0	5
Deer Park No. 2 mine.	do	do	4, 5	Dark brownish olive.	0			1	38	100	0	0	E-1 (1)	0	0	0
Deer Park No. 3 mine.	do	do	5, 6	Dark yellowish to brownish olive.	75	Dendrite specks, thin triangular lattices, and blotches of hematite.		1	70	100	0	0		0	0	0
Deer Park No. 5 mine.	do	do	5, 6	Yellowish to dark brownish olive.	Trace	Rare magnetite specks and hematite dendrite specks.	Rare brown bursts.	2	62	100	0	0		0	0	0
Deerlick Knob (Berry) mine.	Franklin-Sylva	Macon, N. C.	Washer	Pinkish buff and brownish olive.	0		Clay-stained	1	20	100	0	0		0	0	50
Deets, Early, mine.	do	Jackson, N. C.	do	Pale cinnamon brown.	Trace	Rare magnetite specks.	Clay-stained; rare brown dendrite specks.	1	13	100	0	0		0	0	0
Devils Looking Glass mine.	Spruce Pine	Mitchell, N. C.	6	Cinnamon brown with streaks of brownish olive.	35	Scattered spots and specks of magnetite and hematite.	Slightly clay-stained.	2	376	100	0	0	E-1 (1)	0	0	25
Dietz, Jeanie, mine.	Franklin-Sylva	Jackson, N. C.	6	Pale brownish olive to light cinnamon brown.	0		Rare tiny biotite specks.	1	76	100	0	0	E-1 (1)	0	0	0
Dillard, W. G., prospect.	do	do	6	Pale cinnamon brown.	15	Rare magnetite specks.	Sparse rows of brown dendrite specks.	1	17	100	0	0		0	0	0
Dills mine	do	Macon, N. C.	6	Cinnamon brown.	50	Hematite blotches near centers of some books.		1	51	100	0	0		0	0	0
Do	do	do	Washer	do	60	do		1	7	100	0	0				
Dobbin prospect	Amelia	Amelia, Va.	do	Light cinnamon brown.	0		Clay-stained	1	7	100	0	0		0	0	25

Dobson mine	Franklin-Sylva	Macon, N. C.	6	Dark brownish olive.	50	Specks and dendrite spots of hematite with some rods in trigonal pattern.		1	47	100	0	0	E-1 (1)	0	0	0
Do.	do.	do.	Washer	do.	60	do.		1	11	100	0	0				
Dog Pond mine	Spruce Pine	Mitchell, N. C.	5, 6, 7	Cinnamon brown.	Trace	Rare magnetite specks and hematite dendrite spots and specks.	Rare brown bursts.	1	138	100	0	0	E-1 (1)	<5	5	5
Do.	do.	do.	Washer	do.	<5	do.	do.	1	7	100	0	0				
Dolphin, Clinton, mine.	Outlying Virginia.	Powhatan, Va.	7	do.	0		Slightly clay- and iron-stained.	1	127	100	0	0		0	0	0
Double Gap mine	Franklin-Sylva	Jackson, N. C.	Washer	Pinkish buff, with many streaks of dull yellowish olive.	50	Sparse magnetite specks near rims of books.	Local rows of green dendrite specks.	1	17	100	0	0		0	0	0
Doublehead mine	Spruce Pine	Avery, N. C.	5, 6, 7	Brownish olive	10	Sparse magnetite specks and small spots.	Rare brown bursts.	2	84	100	0	0	E-1 (2)	0	0	0
Do.	do.	do.	Washer	do.	100	do.	do.	2	19	100	0	0		0	10	0
Downs, Charlie, prospect.	Franklin-Sylva	Macon, N. C.	6	Pale cinnamon brown.	0		Slightly clay-stained.	1	93	100	0	0		0	0	0
Drawbar mine	Spruce Pine	Mitchell, N. C.	Washer	Yellowish olive, with distinct, sharp color zones.	100	Sparse dendrite specks of hematite.	do.	1	11	100	0	0		0	0	70
Drum mine	Shelby-Hickory	Catawba, N. C.	5½, 6, 7	Light cinnamon brown.	40	Rare specks of magnetite; hematite.	Clay- and iron-stained; scattered brown bursts and greenish dendrite spots.	3	279	100	0	0	E-1 (1)	<5	0	<5
Do.	do.	do.	Washer	do.	10	do.	do.	1	8	100	0	0				
Duck Branch mine.	Spruce Pine	Mitchell, N. C.	do.	Dull yellowish olive.	100	Sparse hematite spots and much curdy stain of green biotite (?) shreds.	Slightly clay-stained.	1	13	100	0	0		0	0	0
Dugger mine	do.	Avery, N. C.	do.	Yellowish olive	100	Heavy concentrations of hematite dendrite specks; arranged in triangular pattern.	do.	1	17	100	0	0		0	0	0
Dycus mine	Shelby-Hickory	Rutherford, N. C.	4, 5, 6, 7	Pale to dark cinnamon brown, streaked with yellowish olive.	10	Local broad rows of magnetite specks, spots, and laths.	Clay-stained; local large brown bursts; some pale-green mottling.	16	2,801	100	0	0	E-1 (15)	Trace	Trace	Trace
Do.	do.	do.	Washer	do.	55	do.	do.	4	52	100	0	0				
Eagle Bluff mine	Spruce Pine	Yancey, N. C.	5, 6, 7	Yellowish to brownish olive.	Trace	Sparse spots of magnetite and hematite.	Some garnet inclusions.	4	315	100	0	0	E-1 (2)	0	0	0
Do.	do.	do.	Washer	do.	<5	do.	do.	1	19	100	0	0				
Eagles Nest mine	do.	Mitchell, N. C.	do.	Dark brownish olive.	50	Scattered dendrite specks of hematite.		1	50	0	0	0		0	0	0
Eaker, Doris, mine.	Shelby-Hickory	Lincoln, N. C.	6, 7	Cinnamon brown	0		Clay-stained	1	67	100	0	0	E-1 (1)	0	0	0
Eanes No. 2 mine	Ridgeway-Sandy Ridge.	Henry, Va.	6, 7	Brown to cinnamon brown.	<5	Sparse specks and spots of magnetite.	Clay-stained; very pale green mottling.	2	97	100	0	0	E-1 (1)	0	0	<5
Do.	do.	do.	Washer	do.	55	do.	do.	1	7	100	0	0				
Eanes No. 2 and Garrett mines.	do.	do.	5, 6	Cinnamon brown, with some yellowish olive.	<5	Rare magnetite spots.	Clay-stained	1	54	100	0	0	E-1 (1)	0	0	0
Do.	do.	do.	Washer	do.	100	do.	do.	1	5	100	0	0				
East Fork prospect.	Franklin-Sylva	Jackson, N. C.	6, 7	Pale brownish olive.	0		do.	1	81	100	0	0	E-1 (1)	0	0	0
East Laport mine	do.	do.	6	Cinnamon brown	0		Clay-stained; rare brown dendrite specks.	1	17	100	0	0	E-1 (1)	0	0	0
Edge mine (near Fawn Mountain).	Spruce Pine	Yancey, N. C.	Washer	Brownish olive	<5	Rare hematite specks.	Slightly clay-stained.	1	15	100	0	0		0	0	0
Edge, John, mine	do.	do.	5, 6	Yellowish to brownish olive.	Trace	Rare magnetite specks.	do.	2	123	100	0	0	E-1 (2)	0	0	0
Do.	do.	do.	Washer	do.	Trace	do.	do.	1	12	100	0	0				
Edwards mine	do.	do.	5, 6	Brownish olive	30	Scattered dendrite spots and blotches of hematite.		1	14	100	0	0	E-1 (1)	0	0	0

TABLE 10.—*General test data for mica specimens, arranged by lot and by mine or prospect*—Continued

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Type of mineral stain	Remarks	Electrical tests: Number of lots tested	Total number of pieces tested	Percent E-1	Percent E-2	Percent E-3	30-mil stack (number of stacks in parentheses)	Proportion of tested defects (to nearest 5 percent): Material with conducting substances	Material with cracks	Material with pinholes
Edwards, J. W., mine.	Spruce Pine	Yancey, N. C.	Washer	Light yellowish green.	0		Clay-stained	1	7	100	0	0		0	0	0
Eli Rock mine	do	Avery, N. C.	6, 7	Brownish olive	0			1	134	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	0			1	5	100	0	0				
Elk (Milton English) mine.	do	do	4, 5, 6, 7	Pinkish buff	<5	Rare dendrite specks and spots of hematite with locally abundant biotite plates and laths.	Garnet inclusions; biotite intergrowths.	6	491	100	0	0	E-1 (2)	0	0	0
Do	do	do	Washer	do	<5	do	do	5	40	100	0	0		0	0	0
Elliot, L. R., mine.	Shelby-Hickory	Cleveland, N. C.	6	Pinkish buff with very pale greenish streaks.	85	Scattered plates and wisps of biotite.	Clay- and iron-stained; rare brown bursts.	2	143	100	0	0		0	0	0
Do	do	do	Washer	do	100	do	do	1	11	100	0	0				
Elmore mine	Franklin-Sylva	Macon, N. C.	6, 7	Yellowish green to wood brown, with broad variations in single books.	Trace	Sparse black oxide specks and biotite blades.	Clay-stained; some green mottling.	3	483	100	0	0	E-1 (3)	0	Trace	5
Do	do	do	Washer	do	Trace	do	do	1	12	100	0	0				
Elmore Branch prospect.	do	do	do	Cinnamon brown	50		Clay-stained	1	8	100	0	0		0	0	0
Emmons Knob mine.	Spruce Pine	Avery, N. C.	5	Yellowish green to yellowish olive.	5	Sparse dendrite specks of hematite.		1	48	98	2	0		0	0	0
Do	do	do	Washer	do	5	do		1	8	100	0	0				
Engle Cope (Cox Murray Mountain) mine.	Franklin-Sylva	Jackson, N. C.	3, 4	Pinkish buff and cinnamon brown, with streaks of pale yellowish olive.	0	Rare magnetite specks.	Clay-stained; scattered pale-green mottling; pyrite inclusions and local biotite intergrowths.	2	440	100	0	0		0	15	0
Do	do	do	Washer	do	60	do	do	2	35	100	0	0		0	0	0
English Knob mine.	Spruce Pine	Mitchell, N. C.	3, 4, 6	Dark yellowish green.	100	Heavy concentrations of hematite dendrite specks, spots, and blotches.	Local pale vegetable stain; garnet inclusions.	2	46	93	0	7		5	0	0
Estatoe Northeast (Mossy Rock) prospect.	do	do	6	Brownish olive	<5	Scattered magnetite spots.	Pale vegetable stain.	1	26	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	60	do	do	1	5	0	100	0		0	0	0
Estatoe Southeast prospect.	do	do	6	Dark brownish olive.	25	Scattered dendrite specks and spots of hematite.	do	1	14	100	0	0		0	0	0
Evans, A. J., prospect.	Franklin-Sylva	Macon, N. C.	Washer	Brownish olive, with local yellowish olive.	75	Hematite blotches, especially abundant near centers of books.		1	11	100	0	0		0	0	0
Evans, Rosa, mine.	Ridgeway-Sandy Ridge.	Rockingham, N. C.	4, 5, 5½, 6, 7.	Yellowish to brownish olive.	0		Abundant vegetable stain, with local shreds of green biotite.	5	882	100	0	0	E-1 (1)	0	20	15
Do	do	do	Washer	do	0		do	1	1	100	0	0				
Ewing mine	Spruce Pine	Avery, N. C.	6, 7	Brownish olive	20	Sparse dendrite specks of hematite and locally abundant biotite plates.	Local green mottling; apatite inclusions; biotite intergrowths.	1	66	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	100	do	do	1	9	100	0	0				

Far Top Field prospect.	Franklin-Sylva	Jackson, N. C.	do	Green, with cinnamon brown at centers of some books.	50	Magnetite specks and small spots in green mica.	Slightly clay-stained.	1	19	100	0	0		0	0	0
Ferguson mine	Wilkes	Wilkes, N. C.	6	Green to yellowish olive.	25	Rare dendrite spots of hematite.	Clay-and iron-stained.	1	95	100	0	0		0	0	0
Ferguson, Judge, mine.	Franklin-Sylva	Jackson, N. C.	6	Light cinnamon brown.	0		Clay-stained	1	22	100	0	0		0	0	0
Field mine	Spruce Pine	Mitchell, N. C.	7	Dark brownish olive.	100	Scattered hematite dendrite specks; biotite (?) shreds.	Clay-stained; abundant green mottling.	1	24	100	0	0		0	0	0
Field prospect	do	do	6	Dark yellowish olive.	0			1	52	100	0	0		0	0	0
Flat Rock mine	do	do	6, 7	Brownish olive	20	Dendrite spots of hematite.	Scattered brown bursts.	2	65	100	0	0	E-1 (1)	0	15	10
Flukens Hill mine	do	do	6	Cinnamon brown.	Trace	Rare magnetite specks.	Clay-stained									
Do.	do	do	6	Dark yellowish green.	Trace	Rare hematite specks.	do	1	65	100	0	0	E-1 (1)	0	0	0
Do.	do	do	Washer	Cinnamon brown.	Trace	Rare magnetite specks.	do									
Do.	do	do	do	Dark yellowish green.	Trace	Rare hematite specks.	do	1	11	100	0	0				
Flukens Ridge mine (head of Blue Rock Branch).	do	Yancey, N. C.	do	Yellowish olive.	Trace	do	do	1	15	100	0	0		0	0	0
Flukens Ridge mine group (at Newdale).	do	do	3	do	0		do	1	92	100	0	0	E-1 (1)	0	0	0
Fortenberry, W. H., prospect.	Shelby-Hickory	Cleveland, N. C.	6	Light cinnamon brown.	<5	Rare magnetite specks.	Clay-and iron-stained.	1	110	100	0	0		0	0	0
Foster No. 1 (W. A. Thompson No. 1) mine.	do	Lincoln, N. C.	5, 5½, 6	Cinnamon brown and yellowish olive.	20	Broad rows of magnetite specks and spots.	Clay-stained	4	236	100	0	0	E-1 (2)	0	0	<5
Foster No. 2 (W. A. Thompson No. 2) mine.	do	do	5, 5½, 6	Yellowish olive and cinnamon brown.	10	Rare magnetite specks.	do	1	100	100	0	0		0	0	10
Foster, J. L., prospect.	do	Cleveland, N. C.	6	Pinkish buff, with pale-greenish streaks.	0		do	1	24	100	0	0	E-1 (1)	0	0	0
Do.	do	do	Washer	do	0		do	1	12	100	0	0				
Foster, W. L. C., prospect.	do	Lincoln, N. C.	6, 7	Yellowish olive with brownish streaks.	100	Scattered wisps of biotite.	do	1	75	100	0	0		0	0	0
Foster, W. T., (W. A. Thompson) mine group.	do	do	4, 5, 5½, 6, 7.	Cinnamon brown and yellowish olive; many colored, zoned books.	<5	Scattered specks and spots of magnetite, especially in greenish parts of books.	Clay-stained; rare brown bursts.	7	1,038	100	0	0	E-1 (6)	5	0	5
Do.	do	do	Washer	do	100	do	do	1	9	100	0	0				
Four Foot Square mine.	Spruce Pine	Avery, N. C.	6	Dark brownish olive.	100	Scattered plates and shreds of green biotite.	Pale-green mottling.	1	16	100	0	0	E-1 (1)	0	50	0
Fowler, Will, prospect.	Outlying South Carolina.	Pickens, S. C.	5, 6	Pale cinnamon brown to light yellowish green.	30	Scattered dendrite spots and blotches of hematite.	Clay-stained	1	22	100	0	0		0	0	20
Fox mine	Franklin-Sylva	Macon, N. C.	Washer	Dull yellowish olive.	10	Sparse dendrite spots of hematite.	Clay-stained; rare brown bursts.	1	18	100	0	0		0	0	0
Frady mine	do	Jackson, N. C.	6	Cinnamon brown, with some pale streaks of brownish olive.	Trace	Rare dendrite specks of brown to black iron oxide.	Clay-stained; some green mottling; rare brown dendrite specks.	1	14	100	0	0	E-1 (1)	0	0	10
Franklin mine	Spruce Pine	Avery, N. C.	5, 6	Brownish olive	35	Scattered plates and shreds of green biotite; rare dendrite specks of hematite.	Clay-stained	1	27	0	0	0	E-1 (1)	0	0	0
Do.	do	do	Washer	do	100	do	do	1	8	0	0	0				
Franklin-Sylva district (localities unknown).	Franklin-Sylva	North Carolina	7	Cinnamon brown.	Trace	Rare magnetite and hematite specks and spots.	Clay-stained; rare brown bursts.									
Do.	do	do	6, 7	Dull yellowish olive.	80	Dendrite spots and triangular lattices of hematite.	do	6	239	100	0	0	E-1 (2)	0	0	0

TABLE 10.—*General test data for mica specimens, arranged by lot and by mine or prospect*—Continued

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Type of mineral stain	Remarks	Electrical tests: Number of lots tested	Electrical tests: Total number of pieces tested	Electrical tests: Percent E-1	Electrical tests: Percent E-2	Electrical tests: Percent E-3	Electrical tests: 30-mil stack (number of stacks in parentheses)	Proportion of tested defects (to nearest 5 percent): Material with conducting substances	Proportion of tested defects (to nearest 5 percent): Material with cracks	Proportion of tested defects (to nearest 5 percent): Material with pinholes
Franklin-Sylva district—Con.	Franklin-Sylva	North Carolina	Washer	Cinnamon brown	<5	Rare magnetite and hematite specks and spots.	Clay-stained; rare brown bursts.									
Do	do	do	do	Dull yellowish olive.	100	Dendrite spots and triangular lattices of hematite.	do	4	37	100	0	0		0	0	0
Furlow Gap (Farlow Gap, Furlough Gap) mine.	do	Transylvania, N. C.	5, 5½, 6	Light brown to light brownish olive, with streaks of pinkish buff.	100	Scattered dendrite specks and spots of hematite.	Rare brown bursts.	1	184	62	35	3		0	0	0
Gaillard mine	Hartwell	Anderson, S. C.	6, 7	Yellowish green	0		Rare tiny dark-brown dendrite spots.	2	210	100	0	0	E-1 (1)	0	0	0
Gaines, C. U., prospect.	do	Elbert, Ga	5, 6	Pale brownish olive.	50	Sparse tiny magnetite specks.	Clay- and iron-stained.	1	55	100	0	0		0	0	0
Gaines, M. L., mine.	do	do	6, 7	Dark brownish olive, brown, and rare yellowish olive.	<5	Scattered magnetite spots and specks.	Clay-stained; local pale-green mottling.	4	250	100	0	0	E-1 (3)	0	0	0
Gantt, B. T., prospect.	Shelby-Hickory	Cleveland, N. C.	6, 7	Cinnamon brown and dull yellowish olive.	<5	Sparse specks of magnetite and hematite.	Clay-stained	2	173	100	0	0		0	0	0
Gantt, M. H., mine.	do	do	5, 6, 7	Cinnamon brown to brown.	15	Sparse spots of hematite and plates of biotite.	Slightly clay-stained.	2	182	100	0	0		0	0	35
Do	do	do	Washer	do	10	do	do	1	9	100	0	0				
Garner mine	Hartwell	Hart, Ga	5, 6, 7	Pale yellowish olive to pale brown.	Trace	Rare magnetite specks.	Slightly clay-stained; local pale-green mottling.	4	286	100	0	0	E-1 (2)	0	0	0
Georges Fork mine.	Spruce Pine	Yancey, N. C.	6	Pale cinnamon brown.	Trace	Rare magnetite and hematite specks.		1	68	100	0	0	E-1 (1)	0	0	0
Gettys No. 1 and No. 2 mines.	Shelby-Hickory	Cleveland, N. C.	5, 6, 7	do	0		Clay- and iron-stained; tiny reddish-brown dendrite specks.	2	108	100	0	0	E-1 (1)	0	0	5
Do	do	do	Washer	do	0		do	1	9	100	0	0				
Gibbs mine	Spruce Pine	Yancey, N. C.	6	Brownish olive	10	Scattered dendrite spots of hematite.	Clay-stained; rare dark-green dendrite spots and laths.	1	23	100	0	0		0	0	0
Do	do	do	Washer	do	10	do	do	1	7	100	0	0		0		0
Gibbs, Elmyra, mine.	do	do	4, 5, 5½, 6.	do	15	Scattered dendrite specks and spots of brown hematite.	Some green mottling; rare tiny green dendrite laths.	6	662	100	0	0	E-1 (4)	0	0	20
Do	do	do	Washer	do	5	do	do	1	8	100	0	0				
Gibbs Spar mine	do	do	5, 6	Cinnamon brown	25	Sparse magnetite spots and rare hematite dendrite spots, some in triangular lattices.	Brownish-green vegetable stain, curdy brownish streaks; garnet inclusions.	1	116	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	25	do	do	1	16	100	0	0				

Gibson mine	Franklin-Sylva	Macon, N. C.	5, 6, 7	Cinnamon brown with some pale brownish olive.	Trace	Rare black iron oxide spots and specks.	Clay-stained	2	442	100	0	0		0	10	0
Gibson prospect	do	do	6, 7	Pale brownish olive.	0		Clay- and iron-stained.	1	12	100	0	0		0	0	0
Gibson, B. S., prospects.	Thomaston-Barnesville.	Upson, Ga.	6	Cinnamon brown.	0		do	2	322	100	0	0	E-1 (1)	0	Trace	5
Gimbel prospect	Spruce Pine	Yancey, N. C.	Washer	Yellowish olive	100	Scattered dendrite specks of hematite.	Heavy brown and bright-green curdy stain.	1	21	100	0	0		0	0	0
Glenn mine	do	Mitchell, N. C.	do	do	50	Large spots of magnetite and hematite.	Clay-stained.	1	12	100	0	0		0	0	0
Glover, Eli, mine	Shelby-Hickory	Cleveland, N. C.	6, 7	Light cinnamon brown and yellowish olive.	<5	Rare iron oxide specks.	do	3	178	100	0	0		0	0	0
Gold, Mary, mine	do	do	6, 7	Cinnamon brown.	Trace	Rare magnetite specks.	Clay- and iron-stained.	3	139	100	0	0	E-1 (2)	0	0	0
Do	do	do	Washer	do	Trace	do	do	2	15	100	0	0				
Googrock mine	Spruce Pine	Yancey, N. C.	6, 7	Light cinnamon brown and light yellowish to dark brownish olive.	10	Clouds of dendrite specks and small spots of hematite.	Slightly clay-stained; sparse green dendrite spots; local vegetable stain; biotite intergrowths.	3	162	100	0	0	E-1 (2)	0	0	0
Do	do	do	Washer	do	65	do	do	3	20	65	35	0		0	0	0
Gopher mine	do	Mitchell, N. C.	do	Yellowish olive to cinnamon brown with green streaks.	10	Rare dendrite spots and specks of hematite.	Clay-stained; scattered brown bursts; zircon inclusions.	2	28	100	0	0		0	0	20
Gouge, Fannie, (Spruce Pine Mica Co. No. 10) mine.	do	Yancey, N. C.	4, 5, 6	Yellowish olive	80	Dendrite spots and blotches of hematite, many in rows; much triangular lattice pattern.	Rare brown bursts.	2	117	100	0	0	E-1 (1)	45	0	60
Gouge, Jim, mine	do	do	6, 7	Deep yellowish olive to brownish olive.	<5	Abundant specks, spots, and blotches of hematite with shreds of biotite.	Rare dark-green dendrite spots.	1	121	100	0	0		0	0	0
Do	do	do	Washer	do	<5	do	do	2	18	100	0	0				
Gouge, Slim, prospect.	do	Mitchell, N. C.	6	Dark brownish olive.	10	Dendrite spots and local lattice patterns of hematite.	Pale vegetable stain.	1	15	100	0	0	E-1 (1)	0	0	0
Gouge Falls prospect.	do	do	6	Green to yellowish green.	100	Dendrite specks and spots of hematite.	Clay-stained	1	37	100	0	0		0	0	0
Do	do	do	Washer	do	100	do	do	1	3	0	100	0				
Gradin (L. C. Presly, Buchanan's Old) mine.	Franklin-Sylva	Jackson, N. C.	do	Pinkish buff	Trace	Rare magnetite specks.	Clay-stained; small brown bursts.	1	10	100	0	0		0	0	0
Graveyard prospect.	Spruce Pine	Mitchell, N. C.	6	Green	100	Heavily stained with dendrite spots and triangular lattices of hematite.	Slightly clay-stained.	1	29	100	0	0	E-1 (1)	0	100	0
Green, J. F., mine	Shelby-Hickory	Cleveland, N. C.	6	Cinnamon brown.	10	Sparse dendrite specks and small spots of hematite.	Clay-stained	2	91	100	0	0	E-1 (1)	0	0	0
Green, Ruben, mine.	Spruce Pine	Avery, N. C.	3, 4, 5, 6, 7.	Yellowish green to light yellowish olive.	5	Rare dendrite specks and spots of hematite.	Local pale-green mottling.	5	667	100	0	0	E-1 (2)	Trace	Trace	10
Do	do	do	Washer	do	20	do	do	1	10	100	0	0				
Green Mountain mine.	do	Yancey, N. C.	5, 5½, 6, 7	Cinnamon brown.	Trace	Sparse brown dendrite spots of hematite; rare magnetite specks.	Slightly clay-stained; sparse pale-brown bursts; some very pale green mottling.	6	608	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	Trace	do	do	2	16	100	0	0		0	0	25
Greer and Merriman mines.	Outlying Virginia.	Henry, Va.	7	Pinkish buff and yellowish olive.	50	Sparse magnetite specks and spots.	Clay- and iron-stained.	1	116	100	0	0		0	0	0
Do	do	do	Washer	do	100	do	do	1	3	100	0	0				

TABLE 10.—*General test data for mica specimens, arranged by lot and by mine or prospect*—Continued

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Type of mineral stain	Remarks	Electrical tests: Number of lots tested	Total number of pieces tested	Percent E-1	Percent E-2	Percent E-3	30-mil stack (number of stacks in parentheses)	Proportion of tested defects (to nearest 5 percent): Material with conducting substances	Material with cracks	Material with pinholes
Gregory mine	Franklin-Sylva	Jackson, N. C.	3, 4, 5	Light yellowish olive, grading into light cinnamon brown; some books color-zoned.	100	Broad belts of magnetite specks and spots.	Local heavy green mottling; some iron stain.	4	422	100 −	Trace	Trace		Trace	Trace	Trace
Do	do	do	Washer	do	90	do	do	1	13	100	0	0				
Griffith, Mills, (Griffin) mine.	Spruce Pine	Yancey, N. C.	5½, 6	Cinnamon brown.	Trace	Rare magnetite specks.	Slightly clay-stained.	2	338	100	0	0		0	0	0
Do	do	do	Washer	do	Trace	do	do	1	5	100	0	0		0	0	<5
Do	do	do	6, 7	Yellowish to brownish olive, with some brown at centers of some books.	20	Abundant magnetite spots, with a little hematite.	do	2	346	100	0	0	E-1 (2)	0	0	0
Do	do	do	Washer	do	100	do	do	1	10	100	0	0				
Griggs mines	Shelby-Hickory	Cleveland, N. C.	6	Cinnamon brown	0		Clay-stained	2	56	100	0	0	E-1 (2)	0	0	0
Do	do	do	6	Light yellowish olive.	50	Sparse dendrite specks of hematite.	do									
Gudger mine	Spruce Pine	Mitchell, N. C.	4, 5, 6, 7	Yellowish to brownish olive.	Trace	Rare magnetite and hematite specks.	Local green mottling.	3	429	100	0	0	E-1 (2)	0	0	0
Gum Gap mine	Franklin-Sylva	Macon, N. C.	6, 7	Pale cinnamon brown.	75	Abundant magnetite specks near centers of some books.	Curdy green to brown mottling.	2	58	100	0	0		75	0	0
Gurney mine	do	do	6, 7	Brownish olive	0		Clay-and iron-stained; pale-green mottling.	1	470	100	0	0	E-1 (1)	0	50	0
Do	do	do	Washer	do	0		do	1	15	100	0	0		0	0	0
Gusher Knob mine.	Spruce Pine	Avery, N. C.	4, 5, 6	Dark yellowish green.	55	Scattered specks and spots of hematite; highly dendritic.		1	19	100	0	0	E-1 (1)	20	0	0
Guy mine	do	Mitchell, N. C.	6	Brownish olive with streaks of pale green.	0			1	62	100	0	0		0	0	0
Do	do	do	Washer	do				1	11	100	0	0				
Gwaltney prospects.	Shelby-Hickory	Alexander, N. C.	5, 6	Pinkish buff to light cinnamon brown.	Trace	Rare dendrite specks of hematite.	Clay- and iron-stained; rare brown dendrite specks.	1	36	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	<5	do	do	1	12	100	0	0				
Hall mine	Wilkes	Wilkes, N. C.	do	Dark yellowish to brownish olive.	25	Sparse dendrite spots of hematite.	Heavily clay-stained.	1	7	100	0	0		0	0	50
Hall prospect	Franklin-Sylva	Macon, N. C.	4, 5, 6	Pinkish buff	0		Clay- and iron-stained.	3	472	100	0	0		0	5	0
Do	do	do	Washer	do	0		do	1	11	100	0	0		0	0	0
Hall, Andy, mine	Spruce Pine	Yancey, N. C.	6, 7	Cinnamon brown	Trace	Rare magnetite specks.	Rare faint vegetable stain.	1	70	100	0	0	E-1 (1)	0	0	0
Hall, Cleveland, mine.	do	do	6	Yellowish olive	Trace	Rare magnetite and hematite specks.		1	57	100	0	0		0	0	0
Hall and Boone mine.	do	Mitchell, N. C.	Washer	Dark yellowish green.	0			1	5	100	0	0		0	0	0

Hall-Burra mine	Franklin-Sylva	Macon, N. C.	4, 5, 6	Light brownish olive, with lighter yellowish-olive streaks.	100	Scattered small spots of magnetite.		2	420	100	0	0		0	0	10
Do	do	do	Washer	do	100	do		1	15	100	0	0				
Hallman mine	Shelby-Hickory	Lincoln, N. C.	6, 7	Pinkish buff, with some pale yellowish green.	0		Slightly clay-stained.	3	245	100	0	0	E-1 (1)	0	0	0
Harding (Charley Young) mine.	Spruce Pine	Yancey, N. C.	5, 5½, 6, 7.	Pale cinnamon brown.	5	Sparse hexagonal spots and laths of magnetite; rare hematite dendrite specks	Clay- and iron-stained; pale-greenish mottling; local brownish curdy stain.	8	1,728	100	0	0	E-1 (7)	0	0	<5
Do	do	do	Washer	do	15	do	do	2	29	100	0	0		0	0	0
Harlan mine	do	Mitchell, N. C.	6	Green	10	Sparse dendrite specks of hematite.		1	15	100	0	0		0	0	0
Do	do	do	Washer	do	100	do		1	18	100	0	0		0	0	50
Harlan prospect	do	do	do	Yellowish olive	100	Sparse specks and spots of magnetite and hematite.	Clay-stained	1	7	100	0	0		0	0	0
Harp and Blevins prospect.	do	Yancey, N. C.	5, 5½, 6	Not determined	0			1	100	100	0	0		0	0	0
Harper-Pierman mine.	Hartwell	Hart, Ga.	6, 7	Light yellowish olive, with brownish streaks.	10	Scattered specks and spots of magnetite.		1	185	100	0	0		0	<5	0
Harris mine	Franklin-Sylva	Macon, N. C.	5, 6	Cinnamon brown, with rare light brownish olive.	0		Rare faint vegetable stain; rare tiny brown bursts; some pale-green mottling.	3	356	100	0	0	E-1 (2)	0	0	0
Do	do	do	Washer	do	0		do	1	7	100	0	0				
Harris mine	Shelby-Hickory	Cleveland, N. C.	6, 7	Pale cinnamon brown with tinges of yellowish olive.	<5	Rare dendrite specks of hematite.	Slightly clay-, iron-, and manganese-stained.	2	114	100	0	0	E-1 (2)	0	0	0
Haw Flat mine	Spruce Pine	Mitchell, N. C.	6	Dark brownish olive to dark yellowish green.	50	Scattered dendrite specks of hematite; rare spots of magnetite.	Slightly clay-stained.	1	18	100	0	0	E-1 (1)	0	0	0
Hawk mine	do	do	3, 4, 5, 6	Yellowish olive	0			3	142	100	0	0	E-1 (3)	0	0	0
Hawkins (Joe Hawkins) mine.	Ridgeway-Sandy Ridge.	Stokes, N. C.	3, 4, 5, 5½, 6, 7.	Cinnamon brown, with tinges of yellowish olive.	<5	Scattered dendrite specks and spots of hematite, with some magnetite spots.	Slightly clay-stained; local pale-green mottling.	11	1,457	100	0	0	E-1 (6)	5	10	<5
Do	do	do	Washer	do	65	do	do	2	25	100	0	0				
Hawkins mine	Spruce Pine	Mitchell, N. C.	6, 7	Very dark brownish olive.	30	Dendrite spots and rods of hematite, some in trigonal pattern; local magnetite spots.		1	46	100	0	0		0	0	0
Hector mine	do	Yancey, N. C.	7	Yellowish olive	0		Clay-stained	1	32	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	0		do	1	9	100	0	0				
Henry, Jake, (Jacob W. Henry, Rocky Face) mine.	Franklin-Sylva	Macon, N. C.	6	Brownish olive	100	Scattered specks and small spots of hematite.	Abundant green mottling and curdy green stain.	1	52	100	0	0		0	0	0
Do	do	do	Washer	do	0	do	do	1	6	100	0	0				
Hensley-Laurel (Charley Young) mine.	Spruce Pine	Yancey, N. C.	4, 5, 5½, 6.	Cinnamon brown.	Trace	Sparse dendrite spots and specks of hematite.	Scattered greenish dendrite specks in some books.	4	338	100	0	0	E-1 (3)	0	0	25
Do	do	do	Washer	do	100	do	do	1	17	100	0	0		0	0	0
Herbb No. 1 mine.	Outlying Virginia.	Powhatan, Va.	6	Cinnamon brown to deep brown.	0		Slightly clay-stained.	1	40	100	0	0	E-1 (1)	0	0	0
Herbb No. 2 mine.	do	do	5, 6, 7	Pale yellowish green and cinnamon brown.	0		Clay-, iron-, and manganese-stained.	2	162	100	0	0	E-1 (2)	0	<5	5
Herndon mine	Shelby-Hickory	Cleveland, N. C.	7	Cinnamon brown.	0		Clay- and iron-stained.	1	156	100	0	0		0	0	0
Herron mine	Thomaston-Barnesville.	Upson, Ga.	5, 6, 7	Yellowish olive and cinnamon brown to dark brown.	20	Scattered magnetite spots and dendrite spots of hematite.	Clay-stained; local green mottling.	2	204	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	100	do	do	1	21	100	0	0				

TABLE 10.—*General test data for mica specimens, arranged by lot and by mine or prospect*—Continued

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Type of mineral stain	Remarks	Electrical tests: Number of lots tested	Total number of pieces tested	Percent E-1	Percent E-2	Percent E-3	30-mil stack (number of stacks in parentheses)	Proportion of tested defects (to nearest 5 percent): Material with conducting substances	Material with cracks	Material with pinholes
Higdon mine	Franklin-Sylva	Jackson, N. C.	6, 7	Light cinnamon brown.	0			2	206	100	0	0	E-1 (1)	0	0	10
Higdon prospect	do	Macon, N. C.	6	Light brownish olive to cinnamon brown.	Trace	Small dendrite spots of hematite.		1	16	100	0	0		0	0	0
Higgins mine	Spruce Pine	Yancey, N. C.	Washer	Yellowish olive	0		Slightly clay-stained.	1	19	100	0	0		0	0	0
Hilliard mine	do	do	6, 7	Pale cinnamon brown.	0			1	18	100	0	0		0	0	0
Hodson prospect	Jefferson-Boone	Ashe, N. C.	6	Light cinnamon brown.	0		Rare tiny brown dendrite specks.	1	143	100	0	0		0	0	0
Hogg mine (core-margin mica).	Outlying Georgia	Troup, Ga.	6, 7	Yellowish green to yellowish olive.	0		Clay-stained; rare garnet inclusions.	1	86	100	0	0	E-1 (1)	0	0	10
Hogg mine (wall-zone mica).	do	do	5, 6, 7	Yellowish to brownish olive.	100	Abundant shreds and plates of biotite, with dendrite spots of hematite; some trigonal lattices.	Clay-and iron-stained.	4	410	50	41	9	E-1 (2); E-2 (1).	100	<5	<5
Do	do	do	Washer	do	100	do	do	2	21	100	0	0				
Hole (Jack Hole) mine.	Ridgeway-Sandy Ridge.	Stokes, N. C.	5, 6	Dark yellowish green.	0		Slightly clay-stained; local faint vegetable stain.	1	51	100	0	0		0	0	0
Holland mine	do	Rockingham, N. C.	6	Yellowish olive	0		Slightly clay-stained.	1	92	100	0	0		0	0	0
Hooper, Aaron, mine.	Franklin-Sylva	Jackson, N. C.	Washer	Dull yellowish olive.	0		Curdy brown stain in centers of some books.	1	20	100	0	0				
Hooper, L. E., (Duke Stephens) mine.	do	do	do	Dark yellowish olive to dark brownish olive.	10	Dendrite spots and blotches of hematite near centers of books.	Sparse dark-green dendrite spots.	2	24	100	0	0		0	0	0
Hootowl mine	Spruce Pine	Mitchell, N. C.	4, 5, 6	Yellowish green to yellowish olive.	100	Heavy concentrations of hematite in dendrite specks, spots, and thin, curdy lattices.	Abundant pale-green vegetable stain.	5	248	98	2	0	E-1 (2)	45	0	0
Hootowl prospect	do	do	Washer	Yellowish green	40	Scattered dendrite specks of hematite.	Clay-stained	1	5	100	0	0		0	0	0
Hoppey mine	do	Avery, N. C.	6	Pale cinnamon brown.	0			1	22	100	0	0		0	0	0
Do	do	do	Washer	do	0			1	22	100	0	0				
Hoppus prospect	do	Mitchell, N C.	6	Yellowish olive	0		Local pale-green mottling.	1	45	100	0	0		0	0	0
Hoppus Northeast mine.	do	do	6, 7	Dull yellowish olive, with tinges of green.	Trace	Sparse dendrite specks of hematite.		1	65	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	5	do		1	8	0	100	0				
Horsehead mine	Hartwell	Hart, Ga.	6	Pale yellowish to brownisholive.	50	Rare magnetite specks.	Slightly clay- and iron-stained.	1	18	100	0	0		0	0	0
Horton Rock mine.	Spruce Pine	Mitchell, N. C.	6	Cinnamon brown	0		Biotite inclusions.	1	23	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	0		do	1	8	100	0	0				

Houser, Plato, mine.	Shelby-Hickory	Lincoln, N. C.	5, 6, 7	Light cinnamon brown with some yellowish olive.	Trace	Scattered specks and spots of magnetite and hematite.	Clay-, iron-, and manganese stained; rare brownish bursts.	5	474	100	0	0	E-1 (5)	0	0	5
Do.	do	do	Washer	do	<5	do	do	2	14	100	0	0				
Houser, Plato, No. 2 mine.	do	do	6	Light cinnamon brown to light yellowish olive.	<5	Scattered dendrite specks of hematite.	Clay-stained	1	37	100	0	0	E-1 (1)	0	0	0
Houston Rock mine.	Spruce Pine	Avery, N. C.	6	Dull yellowish olive.	60	Sparsely scattered specks of hematite and biotite.	Slightly clay-stained; much pale vegetable stain.	1	44	100	0	0	E-1 (1)	0	0	0
Howell prospect	Outlying Virginia.	Charlotte, Va.	6	Brownish olive	100	Scattered hematite dendrite spots and thin shreds of biotite.	Clay-stained	1	87	100	0	0	E-1 (1)	25	0	0
Howell, George, (Waterhole) mine.	Spruce Pine	Mitchell, N. C.	4, 5, 6, 7	Cinnamon brown	Trace	Rare magnetite specks.	Slightly clay-stained; biotite intergrowths.									
Do.	do	do	4, 5, 6, 7	Yellowish olive	<5	Sparse specks and spots of magnetite and hematite.	Clay-stained	5	436	100	0	0	E-1 (5)	0	10	<5
Howell, Jeff, mine.	do	do	5, 6, 7	Brownish olive, grading locally into deep yellowish olive and cinnamon brown.	5	Scattered dendrite spots of hematite, with some small faint triangular lattices.	Some curdy brown stain; local green shreds; rare green and brown bursts.	9	689	100	0	0	E-1 (7)	0	0	0
Do.	do	do	Washer	do	10	do	do	4	47	100	0	0				
Hoyle, A. F., mine.	Shelby-Hickory	Cleveland, N. C.	5, 6, 7	Pinkish buff to cinnamon brown, with yellowish green in some color-zoned books.	<5	Rare dendrite specks of hematite and shreds of biotite.	Clay-stained; local curdy brown stain.	3	417	100	0	0	E-1 (2)	0	0	0
Hudson prospect	do	Burke, N. C.	7	Pinkish buff with narrow streaks of pale yellowish green.	20	Rare magnetite specks and spots.	Clay-stained	1	132	100	0	0		0	0	0
Humphries, Joe E., mine.	do	Cleveland, N. C.	6, 7	Cinnamon brown	75	Rare magnetite specks and biotite wisps.	Slightly clay-stained; local greenish mottling.	1	212	100	0	0		0	0	0
Humphries, W. H., prospect.	do	do	6, 7	Pinkish buff to cinnamon brown.	10	Sparse specks and small spots of biotite (?).	Clay-stained; local green mottling.	2	740	100	0	0		0	0	0
Hunt mine	do	do	6, 7	Cinnamon brown	Trace	Rare magnetite specks.	Local brown bursts.	2	251	100	0	0		0	0	0
Huskins mine	do	Gaston, N. C.	5, 6, 7	Pinkish buff, with tinges of pale yellowish green.	25	Scattered magnetite specks and hematite dendrite specks and spots.	Clay-stained; rare light-brown bursts.	7	1,245	100	0	0	E-1 (5)	0	0	5
Do.	do	do	Washer	do	40	do	do	4	40	100	0	0				
Indian Graveyard mine.	do	Cleveland, N. C.	6, 7	Light cinnamon brown.	<5	Rare tiny dendrite specks of hematite.	Slightly clay-stained; local vegetable stain.	2	111	100	0	0	E-1 (1)	0	0	0
Indiantown (Mull) mine.	do	do	6, 7	Pinkish buff to cinnamon brown.	0		Clay-stained; rare brown dendrite specks.	1	141	100	0	0		0	0	0
Iotla-Bradley (Iotla, Iotla Bridge) mine.	Franklin-Sylva	Macon, N. C.	3, 4, 5, 5½, 6.	Cinnamon brown	Trace		Clay-stained; sparse brown and dark-green bursts and dendrite spots; sparse zircon inclusions.	5	775	100	0	0	E-1 (2)	10	10	Trace
Do.	do	do	Washer	do	0		do	1	17	100	0	0				
Irby Cut mine	Spruce Pine	Yancey, N. C.	do	Dark brownish olive.	0		Rare pale-green vegetable stain.	1	7	0	100	0				

TABLE 10.—*General test data for mica specimens, arranged by lot and by mine or prospect*—Continued

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Type of mineral stain	Remarks	Electrical tests: Number of lots tested	Total number of pieces tested	Percent E-1	Percent E-2	Percent E-3	30-mil stack (number of stacks in parentheses)	Proportion of tested defects (to nearest 5 percent): Material with conducting substances	Material with cracks	Material with pinholes
Isinglass Hill mine.	Outlying North Carolina Piedmont.	Rutherford, N. C.	6, 7	Yellowish to dark brownish olive.	100	Many dendrite specks and spots of hematite, with many triangular lattices.	Clay-stained	1	94	87	13	------	------	100	0	5
Island Ford mine	Franklin-Sylva	Jackson, N. C.	5, 6	Dark greenish olive.	40	Dendrite spots and blotches of hematite.	Local pale-green mottling; rare green dendrite specks.	1	23	100	0	0	E-1 (1)	30	0	0
Do	do	do	Washer	do	50	do	do	1	15	100	0	0	------	------	------	------
Jack Knob mine	do	Macon, N. C.	5½, 6	Light brown to cinnamon brown.	0	------	Sparse brown bursts and dendrite specks; local brown mottling.	2	36	100	0	0	------	0	0	0
Jack Rock mine	Spruce Pine	Mitchell, N. C.	6	Yellowish olive	Trace	Magnetite specks and spots.	Clay-stained	1	74	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	<5	do	do	1	9	100	0	0	------	------	------	------
James mine	do	Yancey, N. C.	6, 7	Brownish olive, with very pale greenish streaks.	15	Sparse hematite dendrite specks and local heavy triangular lattices of curdy stain.	------	4	165	100	0	0	E-1 (2)	15	0	0
Do	do	do	Washer	do	0	do	------	1	8	100	0	0	------	------	------	------
Jase mine	do	Mitchell, N. C.	do	Yellowish olive	30	Tiny hematite specks and thin, cloudy aggregates of hematite flakes.	Slightly clay-stained.	1	15	100	0	0	------	0	0	0
Jase prospect	do	do	6	Brownish olive	75	Scattered dendrite specks and spots of hematite.	Sparse rows of dark-green dendrite specks.	1	51	100	0	0	------	0	0	0
Jasper mine	Franklin-Sylva	Jackson, N. C.	3, 4, 5, 6, 7.	Cinnamon brown and some light brownish olive.	Trace	Rare black hematite specks and spots.	Slightly clay-stained; dark-brown bursts and dendrite specks; local pale-green mottling; some biotite intergrowths.	6	1,112	96	4	0	E-1 (4)	0	10	<5
Do	do	do	Washer	do	Trace	do	do	2	39	100	0	0	------	------	------	------
Jeff Cut (Jeff) mine.	Spruce Pine	Mitchell, N. C.	5, 6	Dark brownish olive.	Trace	Rare hematite specks.	Pale vegetable stain in some books; rare green shreds.	1	71	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	Trace	do	do	1	9	100	0	0	------	------	------	------
Jefferson No. 6 mine.	Amelia	Amelia, Va.	6	Yellowish olive to brown.	25	Sparse dendrite specks and spots of hematite.	Clay-stained; rare brown bursts.	1	91	100	0	0	------	0	0	0
Do	do	do	Washer	do	55	do	do	1	11	100	0	0	------	------	------	------
Jimmy mine (in Archie Norman group).	Shelby-Hickory	Cleveland, N. C.	do	Cinnamon brown to dull yellowish olive.	Trace	Rare iron oxide specks.	Clay-stained	1	7	0	100	0	------	0	0	50
Jimmy Cut mine	Spruce Pine	Mitchell, N. C.	4, 5, 5½, 6, 7.	Dark brownish olive.	Trace	Rare tiny dendrite specks of hematite.	Rows of tiny green dendrite specks in some books.	6	705	100	0	0	E-1 (4)	0	0	5
Do	do	do	Washer	do	Trace	do	do	2	22	100	0	0	------	------	------	------

Johnson mine (on Plumtree Creek).	do	Avery, N. C.	3, 4, 5, 5½, 6.	Cinnamon brown.	0		Rare brown bursts.	3	373	100	0	0	E-1 (2)	0	40	60
Johnson mine	Thomaston-Barnesville.	Upson, Ga.	5, 6	do	Trace	Rare biotite wisps and dendrite specks of hematite.	Clay-stained; rare tiny brown bursts.	2	416	100	0	0		0	0	0
Do	do	do	Washer	do	50	do	do	1	8	100	0	0				
Johnson prospect	Spruce Pine	Mitchell, N. C.	do	Dark yellowish olive.	100	Sparse spots and blotches of hematite.	Heavily clay- and iron-stained.	1	23	100	0	0		0	0	0
Johnson, Ernest, mine.	do	do	5, 5½, 6, 7.	Cinnamon brown.	Trace	Rare spots and specks of magnetite.	Biotite intergrowths.	8	649	100	0	0	E-1 (5)	0	0	10
Do	do	do	Washer	do	<5	do	do	3	34	100	0	0				
Johnson, I. M., mine.	do	Avery, N. C.	5½	Cinnamon brown with tinges of yellowish olive.	0		Slightly clay-stained.	1	28	100	0	0		0	0	0
Do	do	do	Washer	do	0		do	1	21	100	0	0				
Johnson, Theo, mine.	do	Mitchell, N. C.	do	Deep yellowish green.	15	Rare specks of hematite.	Clay-stained	1	7	100	0	0		0	0	0
Jones mine	Shelby-Hickory	Cleveland, N. C.	6, 7	Cinnamon brown.	0		do	1	114	100	0	0		0	0	5
Jones No. 1 mine.	Ridgeway-Sandy Ridge.	Henry, Va.	6, 7	Yellowish olive, with some pale cinnamon brown.	0		Clay-stained; some pale-green mottling.	1	31	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	0		do	1	17	100	0	0				
Jones No. 2 mine.	do	do	6	do	0		Clay- and iron-stained; local pale-green mottling.	1	112	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	0		do	1	9	100	0	0				
Jones, Ruth, mine.	Hartwell	Hart, Ga.	6, 7	Yellowish green to yellowish olive.	35	Abundant biotite plates and rare iron oxide specks.	Clay- and iron-stained.	1	116	100	0	0	E-1 (1)	0	0	0
Justice mine	Spruce Pine	Avery, N. C.	6	Yellowish to brownish olive.	0			1	16	100	0	0		0	0	0
Do	do	do	Washer	do	0			1	8	100	0	0				
Kasson (Holbrook) mine.	Franklin-Sylva	Macon, N. C.	do	Cinnamon brown.	0		Sparse green mottling and vegetable stain.	1	13	100	0	0				
Kay mine	Outlying North Carolina Piedmont.	Rutherford, N. C.	5, 6	Cinnamon brown (muscovite).	Trace	Scattered dendrite specks of hematite and wisps of biotite.	Clay-stained	2	85	100	0	0	E-1 (2)	0	0	0
Do	do	do	5, 6	Very dark brown (biotite).	0		do									
Do	do	do	Washer	Cinnamon brown (muscovite).	50	Scattered dendrite specks of hematite and wisps of biotite.	do	1	8	100	0	0				
Do	do	do	do	Very dark brown (biotite).			do									
Kell mine	Franklin-Sylva	Rabun, Ga.	4, 5, 6, 7	Yellowish green to dark brownish olive.	60	Sparse to abundant dendrite specks and spots of hematite; rare triangular lattices; local abundant biotite shreds.	Slightly clay- and iron-stained.	8	1,410	100	Trace	0	E-1 (7)	10	0	5
Do	do	do	Washer	do	100	do	do	2	30	50	50	0				
Kelly, Lassie, (Pine Knob) mine.	do	Macon, N.C.	6	Light cinnamon brown.	Trace	Magnetite specks and small spots, especially near rims of books.	Clay-stained; locally iron-stained.	1	42	100	0	0		0	0	0
Do	do	do	Washer	do	Trace	do	do	1	9	100	0	0				
Kidd mine	Alabama	Tallapoosa, Ala.	6, 7	Pinkish buff, with some yellowish olive.	55	Scattered large spots of magnetite and dendrite specks of hematite.	Clay-stained; some small brown bursts.	3	468	100	0	0	E-1 (3)	0	Trace	<5
Do	do	do	Washer	do	65	do	do	3	35	100	0	0				
King (Norman and Cecil) mine (in W. T Foster group).	Shelby-Hickory	Lincoln, N. C.	5, 6	Pinkish buff, with pale-greenish streaks.	0	Rare magnetite specks.	Clay-stained; wisps and laths of green biotite near centers of some books.	3	403	100	0	0	E-1 (2)	0	0	0
Do	do	do	Washer	do	Trace	do	do	1	18	100	0	0				

TABLE 10.—*General test data for mica specimens, arranged by lot and by mine or prospect*—Continued

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Type of mineral stain	Remarks	Electrical tests: Number of lots tested	Electrical tests: Total number of pieces tested	Electrical tests: Percent E-1	Electrical tests: Percent E-2	Electrical tests: Percent E-3	Electrical tests: 30-mil stack (number of stacks in parentheses)	Proportion of tested defects (to nearest 5 percent): Material with conducting substances	Proportion of tested defects (to nearest 5 percent): Material with cracks	Proportion of tested defects (to nearest 5 percent): Material with pinholes
King, Marvin, prospects.	Shelby-Hickory	Cleveland, N. C.	6, 7	Pinkish buff to cinnamon brown.	0		Slightly clay-stained; rare brown bursts.	1	79	100	0	0	E-1 (1)	0	0	5
Kinsland prospect.	Franklin-Sylva	Macon, N. C.	Washer	Pale brownish olive.	75	Abundant magnetite specks, spots, and blotches near edges of some books.	Clay-stained	1	15	100	0	0		0	50	0
Kiser mine	do	do	1, 3, 4, 5, 5½, 6, 7.	Cinnamon brown, with some yellowish green and yellowish olive.	Trace	Sparse black iron oxide spots.	Clay- and iron-stained; widespread pale-green mottling; sparse green bursts.	12	1,973	100	0	0	E-1 (5)	0	<5	15
Do	do	do	Washer	do	Trace	do	do	2	25	100	0	0				
Knight mine	Ridgeway-Sandy Ridge.	Rockingham, N. C.	3, 4, 5, 5½, 6, 7.	Dark brownish olive, with local streaks of yellowish olive.	90	Abundant dendrite specks, spots, and blotches of hematite, with many curdy brown rectangular lattices and some thin triangular lattices.	Sparse brown dendrite specks; rare pyrite inclusions.	81	15,987	61	23	16	E-1 (37); E-2(11); E-3(10).	5	10	15
Do	do	do	Washer	do	100	do	do	3	21	100	0	0		15		0
Kolb mine	do	Jackson, N. C.	6	Light pinkish buff, with streaks of yellowish olive.	<5	Sparse magnetite spots in greenish parts of books.	Very slightly clay-stained.	1	46	100	0	0		0	0	0
Lail prospect	Shelby-Hickory	Cleveland, N. C.	5	Yellowish olive	100	Specks, small spots, and laths of magnetite.	Slightly clay-stained; local curdy green stain.	1	131	100	0	0		0	0	0
Landers mine	Spruce Pine	Mitchell, N. C.	6	Brownish olive to brown.	Trace	Rare dendrite specks and spots of hematite.	Slightly clay-stained.	1	51	100	0	0		0	0	0
Do	do	do	Washer	do	Trace	do	do	1	15	100	0	0				
Lattimore mine	Shelby-Hickory	Cleveland, N. C.	6, 7	Cinnamon brown	0		Clay-stained	2	215	100	0	0		0	0	<5
Laurel Branch mine.	Spruce Pine	Yancey, N. C.	6, 7	Brownish olive	Trace	Sparse hematite dendrite spots.	Green films and bursts; locally clay-stained.	1	120	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	Trace	do	do	1	7	100	0	0				
Laws mine	do	do	5, 5½, 6, 7.	Cinnamon brown	5	Sparse dendrite specks of hematite.	Local curdy brown stain.	3	282	100	0	0	E-1 (1)	0	0	25
Leatherman, Pink, mine.	Shelby-Hickory	Lincoln, N. C.	6, 7	Light yellowish olive, with pinkish-buff streaks.	Trace	Rare magnetite specks.	Clay-stained	2	175	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	<5	do	do	1	7	100	0	0				
Leatherman, S. C., prospect.	Franklin-Sylva	Macon, N. C.	6	Very pale cinnamon brown.	0		Sparse brown dendrite specks.	1	62	100	0	0		0	0	0
Ledford mine	Shelby-Hickory	Cleveland, N. C.	5, 6, 7	Pinkish buff	0		Clay- and iron-stained.	1	120	100	0	0	E-1 (1)	0	0	0
Do	Spruce Pine	Yancey, N. C.	6	Brownish olive to brown.	Trace	Very rare magnetite specks.		1	73	100	0	0	E-1 (1)	0	0	0
Ledford Cove mine.	Franklin-Sylva	Macon, N. C.	4, 5, 5½, 6.	Pale cinnamon brown with a little pinkish buff.	Trace	Rare dark-brown to black iron oxide specks.	Clay-stained; scattered small reddish-brown bursts.	6	1,084	100	0	0	E-1 (2)	0	5	0
Do	do	do	Washer	do	Trace	do	do	3	40	100	0	0				

Lenoir prospect	do	do	5, 6, 7	Cinnamon brown	20	Hematite specks, dendrite spots, and laths; some arranged in trigonal pattern.	Clay-and iron-stained.	2	447	100	0	0	----------	0	0	5
Do	do	do	Washer	do	20	do	do	1	9	100	0	0	----------	----------	----------	----------
Letterman, M. P., mine.	Spruce Pine	Yancey, N. C	6	do	Trace	Rare magnetite and hematite specks.	Sparse reddish-brown dendrite specks.	1	15	100	0	0	E-1 (1)	0	0	0
Liberty Hill prospect.	do	Mitchell, N. C	6	Cinnamon brown with many streaks of light yellowish green.	0	----------	Slightly clay-stained; local vegetable stain.	1	42	100	0	0	----------	0	0	0
Lick Ridge mine	do	do	6	Dark brownish olive.	15	Sparse brown hematite spots and specks, with shreds of green biotite(?).	Scattered green dendrite specks.	1	16	100	0	0	E-1 (1)	0	0	
Do	do	do	Washer	do	60	do	do	1	8	100	0	0	----------	----------	----------	----------
Ligon mines	Amelia	Amelia, Va	6, 7	Yellowish green to yellowish olive.	0	----------	Clay-and iron-stained; rare dark-brown bursts.	2	203	100	0	0	E-1 (2)	0	0	0
Do	do	do	Washer	do	0	----------	----------	2	16	100	0	0	----------	----------	----------	----------
Lin Cove prospect.	Franklin-Sylva	Macon, N. C	do	Cinnamon brown	0	----------	Slightly clay- and iron-stained.	1	22	100	0	0	----------	----------	----------	----------
Lincoln Rock mine.	Spruce Pine	Avery, N. C	5, 6, 7	Brown to brownish olive.	<5	Sparse dendrite specks of hematite and locally abundant wisps and plates of biotite.	Local very pale green mottling; biotite intergrowths.	5	483	100	0	0	E-1 (4)	0	<5	15
Do	do	do	Washer	do	100	do	do	1	17	100	0	0	----------	0	0	0
Lincoln Rock No. 2 mine.	do	do	5½, 6	do	0	----------	Biotite intergrowths.	1	100	100	0	0	----------	0	0	0
Little East Fork (Arrowood) mine.	Franklin-Sylva	Haywood, N. C	4, 5, 6	Cinnamon brown	10	Scattered biotite wisps and shreds.	Slightly clay-stained; biotite intergrowths.	3	461	100	0	0	----------	0	5	0
Do	do	do	Washer	do	100	do	do	1	7	100	0	0	----------	----------	----------	----------
Little Hawk Ridge mine.	Spruce Pine	Mitchell, N. C	5, 5½, 6, 7.	Cinnamon brown, with some dark brownish olive.	<5	Rare rows of magnetite spots and sparse dendrite specks of hematite.	Local very faint vegetable stain.	6	541	100	0	0	E-1 (2)	0	0	5
Do	do	do	Washer	do	5	do	do	2	22	100	0	0	----------	----------	----------	----------
Little Spring mine.	Franklin-Sylva	Macon, N. C	do	Cinnamon brown	0	----------	Clay-stained	1	7	0	100	0	----------	0	0	0
Little Zeph mine (part of Zeph Young group).	Spruce Pine	Yancey, N. C	4, 5, 6	Yellowish green to brownish olive.	Trace	Rare magnetite and hematite specks.	Faint vegetable stain; sparse dark-brown to green dendrite specks.	1	66	100	0	0	----------	0	0	0
Do	do	do	Washer	do	Trace	do	do	1	9	100	0	0	----------	0	----------	0
Littlefield mine	Franklin-Sylva	Macon, N. C	6	Pale cinnamon brown.	Trace	Rare magnetite specks.	----------	1	17	100	0	0	----------	0	0	0
Do	do	do	Washer	do	Trace	do	----------	1	9	100	0	0	----------	----------	----------	----------
Locust Rough (B. T. Snopp) mines.	Spruce Pine	Yancey, N. C	5, 6	Brownish olive	100	Dendrite spots and thin, widespread triangular lattices of hematite.	----------	2	85	88	7	5	E-1 (1)	0	5	0
Do	do	do	Washer	do	100	do	----------	2	17	100	0	0	----------	----------	----------	----------
Locust Tree prospect.	Franklin-Sylva	Macon, N. C	6, 7	Cinnamon brown	0	----------	Clay-stained; sparse dark-green dendrite specks.	1	79	100	0	0	----------	0	0	0
Long, John, No. 1 (Flukens) mine.	do	Jackson, N. C	6	do	0	----------	Slightly clay-stained; rare brown dendrite specks.	1	92	100	0	0	----------	0	0	0
Long, John, No. 2 mine.	do	do	5, 6	do	0	----------	Clay-stained; sparse green dendrite specks.	1	41	100	0	0	E-1 (1)	0	0	0
Long Branch mine.	do	do	6, 7	Pale cinnamon brown.	Trace	Rare black dendrite spots of magnetite.	Clay-stained; rare brown bursts.	2	80	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	Trace	do	do	1	14	100	0	0	----------	----------	----------	----------

TABLE 10.—*General test data for mica specimens, arranged by lot and by mine or prospect*—Continued

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Type of mineral stain	Remarks	Electrical tests: Number of lots tested	Electrical tests: Total number of pieces tested	Electrical tests: Percent E-1	Electrical tests: Percent E-2	Electrical tests: Percent E-3	Electrical tests: 30-mil stack (number of stacks in parentheses)	Electrical tests: Proportion of tested defects (to nearest 5 percent): Material with conducting substances	Electrical tests: Proportion of tested defects (to nearest 5 percent): Material with cracks	Electrical tests: Proportion of tested defects (to nearest 5 percent): Material with pinholes
Long Cut mine	Spruce Pine	Mitchell, N. C.	6, 7	Brownish olive	0		Local groups of dark-green dendrite spots.	4	229	100	0	0	E-1 (2)	0	0	0
Do	do	do	Washer	do	0		do	1	11	100	0	0				
Lower Crabtree prospect.	do	Yancey, N. C.	do	Dark olive brown.	0		Clay-stained	1	5	100	0	0		0	0	0
Lower Mack mine.	Franklin-Sylva	Macon, N. C.	6	Cinnamon brown.	0			1	91	100	0	0		0	0	0
Do	do	do	Washer	do	0			1	8	100	0	0				
Lower Sugar Tree Cove mine.	Spruce Pine	Mitchell, N. C.	do	Yellowish olive	100	Abundant dendrite specks and small spots of hematite		1	13	100	0	0		0	0	10
Lower Sugar Tree Cove prospect.	do	do	6, 7	Light cinnamon brown.	20	Rows of magnetite spots.	Slightly clay-stained.	1	62	100	0	0		0	0	0
Lucas, Doc, mine.	Franklin-Sylva	Macon, N. C.	6, 7	Cinnamon brown and yellowish green.	Trace	Rare black iron oxide specks and hexagonal biotite specks.	Slightly clay-stained; biotite intergrowths in some brown books.	5	895	100	0	0	E-1 (3)	<5	15	5
Do	do	do	Washer	do	Trace	do	do	2	16	100	0	0				
Lyle, Doc, mine	do	do	6	Light cinnamon brown.	0			1	39	100	0	0		0	0	0
Lyle Cut mine	do	do	6	Light cinnamon brown, with numerous pale streaks.	20	Sparse specks, small spots, and laths of magnetite.		1	113	100	0	0	E-1 (1)	0	0	0
Lyle Knob mine	do	do	2, 5, 6	Cinnamon brown.	0		Rare rows of brown to bright-green dendrite spots.	3	273	100	0	0	E-1 (2)	0	Trace	10
Do	do	do	Washer	do	0		do	1	9	100	0	0				
M and G mine	Alabama	Clay, Ala.	4, 5, 5½, 6.	do	Trace	Rare spots of magnetite.	Clay-stained; some pale-green mottling.	3	406	100	0	0	E-1 (1)	0	0	5
Madam Bank mine.	Spruce Pine	Avery, N. C.	6	Deep yellowish olive.	0			1	25	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	0			1	15	100	0	0		0	0	0
Malonee mine	Franklin-Sylva	Macon, N. C.	6	Very pale cinnamon brown.	0		Clay-stained	1	13	100	0	0	E-1 (1)	0	0	0
Maria (Old Pinchbeck, Smith) mine.	Amelia	Amelia, Va.	6	Light brownish olive to brown.	0		do	1	152	100	0	0		0	0	0
Martin mine	Shelby-Hickory	Cleveland, N. C.	4, 5, 6	Cinnamon brown.	0		do	3	410	100	0	0	E-1 (2)	0	5	0
Martin, Ben, mine.	Hartwell	Anderson, S. C.	5, 6, 7	do	0		Slightly clay-stained.									
Do	do	do	5, 6, 7	Brownish olive	45	Dendrite spots and specks of hematite, with much triangular lattice.	Some dark-green dendrite spots.	3	211	100	0	0		0	0	0
Martin, J. T., prospects.	Shelby-Hickory	Cleveland, N. C.	7	Cinnamon brown.	<5	Rare iron oxide specks.	Clay- and iron-stained.	1	40	100	0	0		0	0	5
Mason, Lee, mine.	Franklin-Sylva	Macon, N. C.	6	Very pale cinnamon brown.	<5	Specks and small spots of magnetite.	Rare rows of brown dendrite specks.	1	71	100	0	0		0	0	0
Mathis, Wyman, prospect.	Spruce Pine	Yancey, N. C.	5, 6, 7	Not determined.	0		Clay-stained	1	164	100	0	0	E-1 (1)	0	0	0

Mauldin mine	Thomaston-Barnesville.	Upson, Ga	5, 6	Pale cinnamon brown.	0		Clay-stained; locally abundant brown bursts; rare vegetable stain.	2	366	100	0	0	E-1 (2)	0	25	15
Do	do	do	Washer	do	0		do	1	18	100	0	0				
Mauldin Road prospect.	do	do	7	Cinnamon brown	0		Iron-and clay-stained; sparse tiny brown bursts.	1	182	100	0	0		0	0	0
Mauney, Bailey, mine.	Shelby-Hickory	Cleveland, N. C.	6, 7	Light cinnamon brown.	0		Clay-stained	2	239	100	0	0		0	0	0
Mauney, S. S., (Homestead, M. M. Mauney) mine.	do	do	5½, 6, 7	Pinkish buff to cinnamon brown.	5	Rare dendrite specks and spots of hematite.	Slightly clay-stained.	6	739	100	0	0	E-1 (2)	0	0	5
Maurice mine	do	Rutherford, N. C.	6	Pinkish buff	Trace	Rare rows of hematite dendrite specks and spots.	do	1	183	100	0	0		0	0	0
May mine	Franklin-Sylva	Macon, N. C.	5, 6, 7	Pale cinnamon brown.	0		Clay-stained; local "A" structure; rare vegetable stain.	5	759	100	0	0	E-1 (1)	0	0	15
Do	do	do	Washer	do	0		do	3	27	100	0	0		0	0	15
Mays mine	Amelia	Amelia, Va	6	Dull yellowish olive.	100	Dendrite spots and blotches of hematite with coarse trigonal pattern.	Clay-and iron-stained.	1	32	100	0	0	E-1 (1)	100	0	0
Do	do	do	Washer	do	40	do	do	1	7	100	0	0		0	0	50
McBee, Ed, mine	Spruce Pine	Mitchell, N. C.	5, 6, 7	Yellowish to brownish olive.	70	Scattered dendrite specks, spots, and blotches of hematite.	Sparse dark-green dendrite specks.	1	37	0	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	90	do	do	1	7	0	0	0				
McCall, Lin, mine.	Franklin-Sylva	Jackson, N. C.	do	Green	100	Scattered magnetite specks and spots.	Clay-stained	1	15	100	0	0		0	0	0
Do	do	do	do	Brownish olive.	0	do	do									
McChone prospect.	Spruce Pine	Mitchell, N. C.	6	Dark yellowish green.	Trace	Rare magnetite and hematite specks.		1	20	100	0	0		0	0	0
McCrary mine	Franklin-Sylva	Macon, N. C.	Washer	Dark yellowish olive.	0		do	1	9	100	0	0				
McCraw No. 1 (Old Pinchbeck No. 2) mine.	Amelia	Amelia, Va	6, 7	Cinnamon brown, with greenish tinges.	0		Clay-stained; rare brown bursts.	1	65	100	0	0	E-1 (1)	0	0	0
McCraw No. 2 (Old Pinchbeck No. 3) mine.	do	do	6, 7	Brown to cinnamon brown.	0		Clay-stained	1	113	100	0	0		0	0	0
McCraw No. 3 (Old Pinchbeck No. 1) mine.	do	do	6, 7	Light brownish olive to brown.	0		Clay-and iron-stained.	1	112	100	0	0		0	0	0
McDowell, Gaston, mine.	Spruce Pine	Yancey, N. C.	4, 5, 6	Light yellowish olive.	Trace	Rare tiny hematite specks.	Rare brown dendrite specks.	1	71	100	0	0	E-1 (1)	0	0	0
McGinnis, F. G., mine.	Shelby-Hickory	Cleveland, N. C.	5, 6	Pale cinnamon brown.	0		Clay-stained	4	355	100	0	0	E-1 (4)	0	0	0
McKinney mine	Spruce Pine	Mitchell, N. C.	4, 5, 5½, 6.	Green	80	Abundant specks, spots, and blotches of hematite, all dendritic.	Faint vegetable stain; garnet inclusions.	6	848	100	0	0	E-1 (1)	35	0	5
McKinney prospect.	do	do	Washer	do	100	Sparse dendrite specks of hematite.	Clay-stained; faint vegetable stain; garnet inclusions.	1	12	75	0	25		0	0	100
McKinney, Chet, (Black Brothers) mine.	do	Yancey, N. C.	5, 6	Pale cinnamon brown.	0			2	47	100	0	0	E-1 (2)	0	0	0
McKinney, W. A., (Sport Heaton) mine.	do	do	4, 5, 6	Yellowish to brownish olive.	Trace	Rare magnetite and hematite specks.	Slightly clay-stained.	2	257	100	0	0	E-1 (2)	0	0	15
McPeters, Flem, mine.	do	do	6	Yellowish olive to cinnamon brown.	50	Specks, spots, and shreds of magnetite and hematite.	do	1	17	100	0	0	E-1 (1)	0	0	0
McSwain, G. B., mine.	Shelby-Hickory	Cleveland, N. C.	5, 6	Pale cinnamon brown.	0		Clay- and iron-stained; sparse brown to green dendrite specks.	2	101	100	0	0	E-1 (2)	0	0	0

TABLE 10.—*General test data for mica specimens, arranged by lot and by mine or prospect*—Continued

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Type of mineral stain	Remarks	Electrical tests						Proportion of tested defects (to nearest 5 percent)		
								Number of lots tested	Total number of pieces tested	Percent E-1	Percent E-2	Percent E-3	30-mil stack (number of stacks in parentheses)	Material with conducting substances	Material with cracks	Material with pinholes
Meadow mine	Spruce Pine	Avery, N. C.	5, 5½, 6	Brownish olive to dark brown.	20	Abundant scattered dendrite specks, spots, and blotches of hematite, with some thin triangular lattices.	Rare vegetable stain.	5	435	99+	<1	-------	E-1 (2)	60	0	5
Medford, Frank, prospect.	Franklin-Sylva	Haywood, N. C.	6	Yellowish to brownish olive.	80	Scattered dendrite spots and blotches of hematite, with local triangular lattices.	Clay-stained; local brown bursts.	1	56	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	100	do	do	1	14	100	0	0	-------	-------	-------	-------
Merck (Old Hope) mine.	Outlying Georgia	Hall, Ga.	3, 5, 5½, 6, 7.	do	55	Abundant dendrite spots and blotches of hematite, with broad triangular lattices.	Clay-and slightly iron-stained; very pale green mottling.									
Do	do	do	5, 5½, 6	Brownish olive to pale brown.	Trace	Rare spots and specks of magnetite and hematite; local biotite.	do	7	1,044	100	0	0	E-1 (5)	Trace	0	10
Do	do	do	Washer	Yellowish to brownish olive.	100	Abundant dendrite spots and blotches of hematite with broad triangular lattices.	do									
Do	do	do	do	Brownish olive to pale brown.	0	Rare spots and specks of magnetite and hematite; local biotite.	do	1	14	100	0	0	-------	-------	-------	-------
Metcalf mine	Shelby-Hickory	Cleveland, N. C.	6, 7	Light cinnamon brown.	Trace	Rare tiny magnetite specks.	Slightly clay-stained.	2	198	100	0	0	E-1 (1)	0	0	0
Mica Hill mine	Alabama	Tallapoosa, Ala.	5, 5½, 6, 7	Yellowish to brownish olive.	65	Abundant dendrite specks and spots of hematite, with minor shreds of biotite.	Clay-stained; much pale vegetable stain.	6	849	94	6	0	E-1 (3)	5	<5	<5
Do	do	do	Washer	do	100	do	do	1	16	100	0	0	-------	-------	-------	-------
Middle Ridge mine.	Spruce Pine	Yancey, N. C.	5, 6	Light cinnamon brown, with yellowish olive streaks.	<5	Rows of magnetite spots and laths.	Rare dark greenish-brown bursts.	1	25	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	<5	do	do	1	8	100	0	0	-------	-------	-------	-------
Mill Knob mine	Franklin-Sylva	Macon, N. C.	3, 4, 5, 6, 7	Cinnamon brown.	0	-------	Clay-stained and locally iron-stained; sparse biotite intergrowths; dark-brown bursts.	8	1,501	100	0	0	E-1 (6)	Trace	5	5
Do	do	do	Washer	do	0	-------	do	5	64	100	0	0	-------	0	0	10
Mill Race mine	Shelby-Hickory	Cleveland, N. C.	5½, 6	Pinkish buff, with pale-greenish streaks.	Trace	Rows of magnetite specks, spots, and laths; rare hematite.	Clay- and iron-stained; rare pale-green dendrite spots; biotite intergrowths.	2	187	100	0	0	-------	0	0	0
Do	do	do	Washer	do	25	do	do	2	35	100	0	0	-------	0	0	0

Mill Race mine	Spruce Pine	Avery, N. C.	2, 3, 4, 5½, 6, 7.	Dark yellowish olive.	0	Plates and laths of green to brownish-green biotite at centers of some books.	Slightly clay-stained; rare light-brown bursts.	5	578	100	0	0	E-1 (2)	0	0	0
Do.	do.	do.	Washer	do.	75	do.	do.	1	16	100	0	0		0	0	0
Miller (Sanders) mine.	Franklin-Sylva	Macon, N. C.	5, 6	Cinnamon brown, with rare pale pinkish buff and brownish olive.	0		Slightly clay- and iron-stained.	1	77	100	0	0	E-1 (1)	0	0	0
Miller mine (north of Penland).	Spruce Pine	Mitchell, N. C.	5, 6	Brownish olive	Trace	Scattered dendrite specks and spots of hematite.	Slightly clay-stained.	2	176	100	0	0	E-1 (2)	0	0	0
Do.	do.	do.	Washer	do.	<5	do.	do.	1	9	100	0	0				
Miller mine (west of Spruce Pine).	do.	do.	7	Yellowish olive	0		do.	1	81	100	0	0	E-1 (1)	0	0	0
Do.	do.	do.	Washer	do.	0		do.	1	9	100	0	0				
Mills, Luce, prospect.	Franklin-Sylva	Jackson, N. C.	do.	Brownish olive to cinnamon brown.	<5	Brown dendrite specks of hematite at centers of books.	Clay-stained; curdy brown stain at centers of some books.	1	9	100	0	0		0	0	0
Mitchell Creek mine.	Thomaston-Barnesville.	Upson, Ga.	3, 4, 5, 5½, 6, 7.	Cinnamon brown	0	Rare biotite specks and pyrite inclusions.	Slightly clay-stained; biotite intergrowths; apatite and pyrite inclusions; rare brown bursts.	8	1,169	100	0	0	E-1 (2)	0	10	Trace
Do.	do.	do.	Washer	do.	<5	do.	do.	4	30	100	0	0				
Mitzes mine	Buncombe	Buncombe, N. C.	5, 6, 7	Cinnamon brown to brownish olive.	50	Sparse specks and spots of hematite and magnetite, with local greenish shreds of biotite(?).	Clay- and iron-stained; much curdy green mottling.	1	129	100	0	0	E-1 (1)	<5	0	<5
Do.	do.	do.	Washer	do.	100	do.	do.	1	22	100	0	0				
Monteiro (Monteiro Tract) mine.	Outlying Virginia.	Goochland, Va.	2, 3, 4	Deep brownish olive to cinnamon brown.	0		Slightly clay-stained.	1	16	100	0	0		0	0	5
Moody mine	Franklin-Sylva	Macon, N. C.	5½, 6, 7	Cinnamon brown	Trace	Rare magnetite specks.	Clay-stained; rare brown bursts.	3	307	100	0	0	E-1 (2)	0	0	0
Moore, A. J., mine.	do.	do.	Washer	do.	30	Sparse magnetite spots.	Slightly clay-stained.	1	15	100	0	0		0	0	0
Moore, Jim, mine.	do.	do.	6, 7	do.	0		Clay- and iron-stained; rare dark-brown bursts and dendrite spots.	9	1,563	100	0	0	E-1 (9)	0	0	5
Do.	do.	do.	Washer	do.	0		do.	5	62	100	0	0				
Moose mine	Shelby-Hickory	Catawba, N. C.	6, 7	Pinkish buff	0		Slightly clay-stained.									
Do.	do.	do.	6, 7	Dark yellowish green to yellowish olive.	20	Blotches of hematite, with some rows of blotches and many triangular lattices.	do.	3	142	100	0	0	E-1 (2)	40	0	0
Do.	do.	do.	Washer	Pinkish buff	0		do.									
Do.	do.	do.	do.	Dark yellowish green to yellowish olive.	100	Blotches of hematite, with some rows of blotches and many triangular lattices.	do.	2	26	100	0	0				
Moose mine	do.	Cleveland, N. C.	do.	Cinnamon brown	0		do.	1	12	100	0	0		0	0	25
Morefield mine	Amelia	Amelia, Va.	6, 7	Brownish olive to dark brown.	20	Sparse flakes and shreds of biotite, with some dendrite specks and spots of hematite.	Slightly clay-stained; some pale-green mottling and brown bursts.	4	744	100	0	0	E-1 (3)	<5	0	0
Do.	do.	do.	Washer	do.	40	do.	do.	3	29	100	0	0		0	0	5
Morgan, Denver, prospect.	Franklin-Sylva	Macon, N. C.	6	Pinkish buff to cinnamon brown.	0			1	43	100	0	0		0	0	0
Morrison, C. R., (Oak Level) mine.	Outlying Virginia	Henry, Va.	6	Pinkish buff, with streaks of yellowish olive.	50	Rare spots and specks of magnetite.	Clay- and iron-stained.	1	139	100	0	0	E-1 (1)	0	0	0
Do.	do.	do.	Washer	do.	100	do.	do.	1	11	100	0	0				

TABLE 10.—*General test data for mica specimens, arranged by lot and by mine or prospect*—Continued

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Type of mineral stain	Remarks	Electrical tests: Number of lots tested	Total number of pieces tested	Percent E-1	Percent E-2	Percent E-3	30-mil stack (number of stacks in parentheses)	Proportion of tested defects (to nearest 5 percent): Material with conducting substances	Material with cracks	Material with pinholes
Moss mine	Franklin-Sylva	Jackson, N. C.	5, 6, 7	Light yellowish to brownish olive, with tinges of pinkish buff.	Trace	Rare magnetite and hematite specks and small spots.	Clay-and iron-stained; pale-green mottling; sparse small brown bursts; zircon inclusions.	4	514	100	0	0	E-1 (3)	0	Trace	Trace
Moss Knob mine	do	Macon, N. C.	5½, 6	Cinnamon brown	0		Brown and green mottling.									
Do	do	do	5½, 6	Yellowish olive	75	Magnetite spots near rims of books.	Clay-stained	1	82	100	0	0		0	0	0
Moulton (Big Meadow) mine.	Spruce Pine	Avery, N. C.	5, 6	Deep yellowish olive.	0		Slightly clay-stained.	1	44	100	0	0	E-1 (1)	0	0	0
Mount Hope Church prospects.	Franklin-Sylva	Macon, N. C.	6, 7	Light brownish olive to light cinnamon brown.	0		Clay-stained	1	16	100	0	0		0	0	0
Mountain Top mine.	Spruce Pine	Mitchell, N. C.	5, 6	Olive brown	10	Scattered dendrite specks and spots of hematite.	Clay-stained; local faint vegetable stain.	1	47	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	20	do	do	1	7	100	0	0				
Mud Hole mine	Franklin-Sylva	Macon, N. C.	6, 7	Light cinnamon brown.	20	Sparse limonite-stained specks and small spots of magnetite.	Clay-and iron-stained; sparse zircon inclusions.	2	128	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	10	do	do	2	22	100	0	0				
Mud Hole prospect.	do	do	7	do	0		Clay-stained; rare, very faint green mottling.	1	19	100	0	0		0	0	0
Murphy Rock mine (on Crabtree Creek).	Spruce Pine	Mitchell, N. C.	6	Dark brown to dark brownish olive.	100	Scattered dendrite spots and specks of hematite.		1	33	100	0	0		0	0	0
Murphy Rock mine (on Rebels Creek).	do	do	5, 6, 7	Cinnamon brown	0		Local pale vegetable stain.	3	426	100	0	0	E-1 (2)	0	0	5
Murray Mountain (Murray Cove) mine.	Franklin-Sylva	Jackson, N. C.	Washer	Cinnamon brown with pale-greenish streaks.	0		Clay-and iron-stained.	1	15	100	0	0		0		75
New Balsam Gap (Abernathy Watershed) mine.	Buncombe	Buncombe, N. C.	5, 6	Light cinnamon brown.	50	Sparse magnetite and hematite specks and spots.	Clay-stained; local brown dendrite spots; some green mottling.	1	83	100	0	0		0	0	0
New Bethel M. E. Church prospect.	Hartwell	Elbert, Ga.	7	Cinnamon brown, with concentric bands of yellowish olive.	0	Rare hematite dendrite specks and sparse biotite shreds.	Clay-and iron-stained.	1	73	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	35	do	do	1	9	100	0	0				
New Wolff (New Wolff No. 1, Wolff, Old Wolff) mine.	Franklin-Sylva	Jackson, N. C.	5, 6, 7	Yellowish olive to brownish olive; books color-zoned.	10	Dendrite spots and long needles of hematite; thin triangular lattices.	Sparse dark-green dendrite spots; slightly clay-stained.	3	113	97	0	3	E-1 (1)	5	0	0
Niagara mine	Shelby-Hickory	Cleveland, N. C.	5, 6, 7	Cinnamon brown	70	Sparse plates and wisps of biotite.	Clay-and iron-stained; rare green dendrite specks.	2	220	100	0	0	E-1 (1)	0	0	0

Do	do	do	Washer	Yellowish green, with brownish streaks.	70	Rows of magnetite specks, spots, and laths.	do	2	14	100	0	0		0	0	0
Nichols, Doc, mine.	Franklin-Sylva	Jackson, N. C.	6	Yellowish olive to pale cinnamon brown.	25	Magnetite spots and laths in trigonal pattern.	Clay-and iron-stained.	1	35	100	0	0		0	0	0
Nicholson, Andy, mine.	do	do	6, 7	Pale brownish olive to cinnamon brown.	Trace	Rare specks and tiny laths of magnetite.	Slightly clay-stained; faint vegetable stain.	1	142	100	0	0		0	50	25
Do	do	do	Washer	do	Trace	do	do	1	15	100	0	0				
Norman, Archie, (W. H. Thompson) mines.	Shelby-Hickory	Cleveland, N. C.	6	Cinnamon brown, with pale-greenish streaks.	25	Rare dendrite specks of hematite.	Clay-and iron-stained.	1	52	100	0	0		0	0	0
Norman-Thompson (W. H. Thompson) mine (in Archie Norman group).	do	do	6	do	Trace	do	Clay-and iron-stained; rare brown bursts.	2	127	100	0	0	E-1(2)	0	0	0
Do	do	do	Washer	do	25	do	do	1	8	100	0	0				
Norton mine	Franklin-Sylva	Rabun, Ga.	3, 4, 5, 6, 7.	Yellowish to brownish olive.	85	Abundant dendrite specks and spots of hematite, with many thin triangular lattices.	Slightly clay-stained.									
Do	do	do	6, 7	Light green	0		Slightly clay-stained; very pale green mottling.	9	1,269	84	2	14	E-1 (7); E-2 (1); E-3 (1).	80	Trace	<5
Do	do	do	Washer	Yellowish to brownish olive.	100	Abundant dendrite specks and spots of hematite, with many thin triangular lattices.	Slightly clay-stained.									
Do	do	do	do	Light green	0		Slightly clay-stained; very pale green mottling.	2	21	100	0	0				
Old Gibbs (Washout, Bland, Gibbs Clay) mine.	Spruce Pine	Yancey, N. C.	6	Brownish olive	Trace	Scattered dendrite spots of hematite.	Local, very faint vegetable stain.	1	36	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	<5	do	do	2	19	100	0	0		0	0	0
Old Owlie mine (in Bailey Mountain group).	do	do	3	do	100	Scattered dendrite spots and faint triangular lattices of hematite.	Local, faint vegetable stain.	1	31	100	0	0	E-1 (1)	0	0	0
Old Rock mine	do	Avery, N. C.	4, 5, 6	Green	0			2	175	100	0	0	E-1 (1)	0	0	0
Ollis, Jake, mine.	do	do	5, 6	Yellowish to brownish olive.	70	Hematite dendrite spots and large blotches; some rows of spots.	Local small brown bursts.	4	150	91	6	3	E-1 (1)	10	0	Trace
Do	do	do	Washer	do	50	do	do	2	19	100	0	0				
Painter mine	Franklin-Sylva	Jackson, N. C.	6	Cinnamon brown with yellowish olive streaks.	100	Broad rows of magnetite specks and large spots.	Rare, very faint vegetable stain.	1	65	100	0	0		0	25	0
Pancake mine	Spruce Pine	Avery, N. C.	Washer	Pale yellowish green to yellowish olive.	0			1	17	100	0	0		0	0	0
Pannell mine	do	Mitchell, N. C.	5, 5½, 6	Brownish olive	Trace	Sparse specks and dendrite spots of hematite.		3	320	100	0	0	E-1 (2)	0	0	20
Do	do	do	Washer	do	50	do		1	7	100	0	0				
Parker, Jerome, mine.	Franklin-Sylva	Jackson, N. C.	do	Cinnamon brown	0		Clay-stained	1	11	100	0	0		0	0	0
Parker Knob mine.	do	do	6	do	0		do	1	91	100	0	0		0	0	0
Patterson mine	Shelby-Hickory	Alexander, N. C.	5	Light brown to cinnamon brown.	0		Clay-and iron-stained; local biotite intergrowths.	1	45	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	0		do	1	7	100	0	0				
Patterson, Bun, (Old Carroll) mine.	do	Cleveland, N. C.	6	Cinnamon brown	<5	Rare specks of iron oxide.	Clay-and iron-stained; rare pale-green mottling.	1	16	100	0	0		75	0	0
Peeler No. 1 mine.	do	do	7	Pinkish buff to cinnamon brown.	<5	Rare dendrite specks of hematite.	Slightly clay-stained.	1	22	100	0	0		0	0	0

TABLE 10.—*General test data for mica specimens, arranged by lot and by mine or prospect*—Continued

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Type of mineral stain	Remarks	Electrical tests: Number of lots tested	Total number of pieces tested	Percent E-1	Percent E-2	Percent E-3	30-mil stack (number of stacks in parentheses)	Proportion of tested defects (to nearest 5 percent): Material with conducting substances	Material with cracks	Material with pinholes
Pegram mine	Spruce Pine	Mitchell, N. C.	6	Dark brownish olive to dark yellowish green.	10	Sparse dendrite specks of hematite	Scattered dark-green dendrite spots.	2	56	100	0	0	E-1 (2)	0	0	0
Pendergrass prospect.	Franklin-Sylva	Macon, N. C.	5	Dark brown	100	Large spots and heavy triangular lattices of dark-brown hematite.		1	65	100	0	0	E-1 (1)	20	0	0
Do	do	do	Washer	do	100	do		1	8	100	0	0				
Penland Southeast prospect.	Spruce Pine	Mitchell, N. C.	do	Brownish olive	100	Scattered hematite dendrite spots near centers of books.	Clay-stained	1	15	100	0	0		0	0	100
Pepper Pot (Perrin) mine.	do	do	5, 5½, 6	Dull yellowish olive.	5	Abundant dendrite spots, specks, and thin lattices of hematite.		3	294	100	0	0	E-1 (1)	0	5	0
Phillips (Birdeye) mine.	do	do	5, 6	Yellowish to dark brownish olive.	Trace	Rare aggregates of hematite specks.	Slightly clay-stained.	1	40	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	Trace	do	do	1	7	100	0	0				
Pine Mountain mine.	do	do	5, 6, 7	Dark brown	0		do	}								
Do	do	do	Washer	Yellowish olive	75	Dendrite spots and triangular lattices of hematite.	do	2	58	0	0		21	0	0	
Pine Ridge mine	Franklin-Sylva	Jackson, N. C.	6	Light pinkish buff.	Trace	Sparse magnetite spots.	do	1	85	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	<5	do	do	2	14	100	0	0		0	0	0
Piney Mountain Creek (Bearwallow Fork) mine.	do	do	6	Light cinnamon brown.	0		Clay-stained; rare tiny pyrite inclusions.	2	131	100	0	0	E-1 (1)	10	0	0
Do	do	do	Washer	do	0		do	1	7	100	0	0				
Pinhook Creek mine.	do	do	6, 7	Dark brownish olive.	25	Scattered dendrite spots and blotches of hematite.	Very slightly clay-stained.	1	19	100	0	0		0	0	0
Do	do	do	Washer	do	50	do	do	1	9	100	0	0				
Pinhook Gap mine.	do	do	5	do	25	Dendrite spots and blotches of hematite with minor magnetite specks and spots.	Slightly clay-stained.	1	92	100	0	0		0	0	0
Do	do	do	Washer	do	30	do	do	1	8	100	0	0				
Plumtree (Race) mine.	Spruce Pine	Avery, N. C.	do	Brownish olive	70	Specks and spots of hematite with local faint triangular lattices.	do	1	13	100	0	0		0	0	0
Poll Hill mine	do	Yancey, N. C.	3, 4, 5, 5½, 6, 7.	do	5	Scattered dendrite specks and spots of hematite.	Rare thin, pale-green shreds.	8	905	100	0	0	E-1 (5)	0	0	5
Do	do	do	Washer	do	55	do	do	3	41	100	0	0		0	0	10
Poll Miller (Burningtown) mine.	Franklin-Sylva	Macon, N. C.	3, 4, 5, 6	Cinnamon brown	15	Rare magnetite spots, specks, and rods.	Slightly clay-stained; rare intergrown quartz; rare green mottling.	6	1,000	100	0	0	E-1 (1)	0	Trace	0
Do	do	do	Washer	do	0	do	do	4	27	100	0	0				
Poplar Cove prospect.	do	do	6, 7	Very pale cinnamon brown.	0		Clay-stained; very pale vegetable stain.	1	42	100	0	0		0	0	0

Potato Cove (Tater Cove) mine.	do	Jackson, N. C.	Washer	Dull yellowish olive with some cinnamon brown.	Trace	Rare magnetite spots.	Clay-stained	1	20	100	0	0		0	0	0
Potato Hill mine	Spruce Pine	Mitchell, N. C.	5, 6, 7	Cinnamon brown and brownish olive.	<5	Dendrite specks and tiny triangular lattices of hematite.	Clay-stained; curdy green to brown stain.	1	52	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	10	do	do	1	15	53	47	0				
Poteat mine	do	do	5, 6, 7	Yellowish olive to dark brownish olive.	90	Dendrite spots and blotches of hematite, with some laths of magnetite in trigonal pattern.		4	240	100	0	0		50	0	0
Do	do	do	Washer	do	50	do		3	27	100	0	0		0	0	0
Poteat prospect	do	do	do	Yellowish olive	10	Rare specks of magnetite and hematite.	Clay-stained	1	15	100	0	0		0	0	100
Poteat Southwest prospect.	do	do	6	Light yellowish olive.	Trace	Very rare magnetite spots.	do	1	51	100	0	0		0	0	0
Do	do	do	Washer	do	Trace	do	do	1	8	100	0	0		0	0	0
Poteat West prospect.	do	do	do	Pinkish buff with pale-green streaks.	100	Sparse magnetite spots and specks.	Scattered brown bursts.	1	9	100	0	0		0		50
Powdermill Rough mine.	do	Avery, N. C.	5	Dark brownish olive.	100	Scattered dendrite spots of hematite, with some thin triangular lattices.	Slightly clay-stained.	1	48	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	100	do	do	1	7	100	0	0				
Powell (Sugar Barrel) mine.	Shelby-Hickory	Cleveland, N. C.	6, 7	Cinnamon brown	0		Slightly clay-stained; local pale-green mottling.	1	142	100	0	0		0	0	0
Presley, Bud, mine.	Franklin-Sylva	Jackson, N. C.	6	Dark yellowish olive.	30	Magnetite spots, hematite dendrite spots and triangular lattices, and abundant green iron oxides.	Heavy green vegetable stain; sparse green blotches.	1	35	100	0	0		0	10	80
Do	do	do	Washer	do	50	do	do	1	13	100	0	0				
Presley, Mack, mine.	do	do	6	Cinnamon brown	0		Clay-stained; small brown bursts.	1	23	100	0	0		0	0	0
Presley, S. W., mine.	Spruce Pine	Yancey, N. C.	4, 5, 6	do	Trace	Rare magnetite spots.	Very faint vegetable stain; rare large brown bursts.	2	118	100	0	0	E-1 (2)	0	0	0
Presnell (Presley) mine.	do	do	5, 5½, 6	Pinkish buff	do	Sparse magnetite specks and spots.	Slightly clay- and iron-stained.	4	267	100	0	0	E-1 (4)	0	0	0
Price mine	Ridgeway-Sandy Ridge.	Henry, Va.	5, 6	Dark brownish olive.	70	Abundant dendrite specks, spots, and blotches of hematite; some trigonal lattices.		2	146	100	0	0	E-1 (2)	0	0	0
Do	do	do	Washer	do	90	do		2	35	100	0	0				
Price, J. B., mine	Franklin-Sylva	Jackson, N. C.	6	Yellowish olive	100	Hematite dendrite spots and blotches, some in crudely trigonal pattern.		1	35	100	0	0		0	0	0
Prince, J. S., (Ben Queen) prospect.	do	do	6	Dull yellowish olive with streaks of cinnamon brown.	0		Clay-stained; sparse lines of tiny green specks.	1	15	100	0	0	E-1 (1)	0	0	0
Proffitt, W. A., mines (lower mine).	Wilkes	Wilkes, N. C.	6, 7	Yellowish to brownish olive.	<5	Sparse tiny dendrite specks of hematite.	Slightly clay-stained; local, very pale green mottling.	1	57	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	50	do	do	1	8	100	0	0				
Putman (Gray) mine.	Franklin-Sylva	Haywood, N. C.	5, 6, 7	Cinnamon brown	95	Abundant scattered shreds and laths of green to brown biotite.	Slightly clay-stained; biotite intergrowths.	3	467	100	0	0		0	5	0
Do	do	do	Washer	do	100	do	do	2	27	100	0	0				
Putman mine	Spruce Pine	Mitchell, N. C.	5, 6	Brownish olive	Trace	Sparse dendrite specks and spots of hematite.		3	75	100	0	0	E-1 (2)	0	0	0
Putman, Marsh, mine.	do	do	5, 6	Pale cinnamon brown.	<5	Sparse magnetite specks; large biotite shreds.	Rare biotite intergrowths; faint vegetable stain.	1	23	100	0	0		0	0	0
Do	do	do	Washer	do	10	do	do	1	15	100	0	0				

TABLE 10.—*General test data for mica specimens, arranged by lot and by mine or prospect*—Continued

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Type of mineral stain	Remarks	Electrical tests: Number of lots tested	Total number of pieces tested	Percent E-1	Percent E-2	Percent E-3	30-mil stack (number of stacks in parentheses)	Proportion of tested defects (to nearest 5 percent): Material with conducting substances	Material with cracks	Material with pinholes
Putnam mines	Shelby-Hickory	Cleveland, N. C.	6, 7	Pinkish buff to cinnamon brown, with pale-greenish streaks.	10	Narrow rows of magnetite specks and tiny laths.	Slightly clay-stained.	2	169	100	0	0		0	0	0
Pyatte, Zeb, mine	Spruce Pine	Avery, N. C.	6	Yellowish to brownish olive.	95	Triangular lattices of hematite dendrite specks and spots.		1	200	93	4	3		100	<5	<5
Queen mine	do	Mitchell, N. C.	5, 6	Yellowish green.	100	Large dendrite spots and abundant triangular lattices of hematite.	do	1	32	100	0	0		0	100	50
Queen, Oscar, mine.	Franklin-Sylva	Jackson, N. C.	6	Yellowish olive.	50	Sparse magnetite spots and rectangular lattices of light-brown iron oxide.	Clay-stained	1	70	100	0	0	E-1 (1)	0	0	0
Quizzenberry mine.	do	Macon, N. C.	Washer	Pinkish buff with pale-greenish streaks.	50	Rare magnetite spots.	Clay-stained; sparse light-brown bursts.	1	8	100	0	0		0		0
Raby (Grady Duvall) mine.	do	do	4, 5, 6, 7	Cinnamon brown.	<5	Rare dendrite specks of hematite(?).	Slightly clay-stained; biotite intergrowths; rare tiny brown bursts.	3	515	100	0	0	E-1 (1)	0	Trace	<5
Do	do	do	Washer	do	15	do	do	2	30	100	0	0				
Raco mine	do	Jackson, N. C.	6	do	<5	Small magnetite spots and hematite dendrite spots.		1	19	100	0	0	E-1 (1)	0	0	0
Radeker, J., mine.	do	do	6	do	0		Clay-stained	1	65	100	0	0		0	0	0
Do	do	do	Washer	do	0		do	1	15	100	0	0				
Randall mine	Spruce Pine	Mitchell, N. C.	6	Pinkish buff	Trace	Scattered magnetite spots.	Local faint green mottling; inclusions of zoisite.	1	44	100	0	0		0	0	0
Do	do	do	Washer	do	100	do	do	1	7	100	0	0				
Randall and Indiantown mines.	Shelby-Hickory	Cleveland, N. C.	6	Cinnamon brown.	0		Local pale-green mottling.	1	93	100	0	0		0	0	0
Raven Cliff mine	Spruce Pine	Mitchell, N. C.	5, 5½, 6	Yellowish to brownish olive.	0			3	333	100	0	0	E-1 (2)	0	0	0
Do	do	do	Washer	do	0			1	8	100	0	0				
Ray (Wray) mine.	do	Yancey, N. C.	5½, 6	Pinkish buff with streaks of cinnamon brown, pale brownish olive, and pale yellowish green.	0		Rare brown bursts and dendrite spots	5	286	100	0	0	E-1 (3)	0	0	<5
Ray, Lissie, prospects.	Franklin-Sylva	Macon, N. C.	6	Pale cinnamon brown.	0		Rare dark-brown dendrite specks.	1	15	100	0	0		0	50	0
Ray, Tom, prospect.	do	do	6	do	0		Clay-stained	1	45	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	0		do	1	9	100	0	0				

Ray Cove prospect.	do	do	6	do	0		Clay-stained; sparse green mottling; rare brown dendrite spots.	1	74	100	0	0		0	0	0
Red mine	Spruce Pine	Avery, N. C.	6, 7	do	40	Sparse hematite dendrite spots and specks.	Slightly clay-stained; local brown bursts.	2	217	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	20	do	do	2	10	100	0	0				
Red (Bennett) mine.	do	Yancey, N. C.	6	Yellowish green to brownish olive.	100	Abundant specks, spots, and laths of magnetite.	Local pale-brown curdy stain.	1	11	100	0	0		0	0	0
Red prospect	do	Avery, N. C.	6	Yellowish olive to light brown.	0			1	112	100	0	0		0	0	0
Reed mine	Shelby-Hickory	Burke, N. C.	6	Deep cinnamon brown with prominent streaks of pale yellowish green.	Trace	Rare magnetite specks.	Clay-stained; sparse brown dendrite spots.	1	24	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	Trace	do	do	1	14	100	0	0				
Reed, Sally, mine.	Franklin-Sylva	Jackson, N. C.	do	Light cinnamon brown.	10	Scattered dendrite spots and specks of hematite.	Slightly clay-stained; local brown mottling.	1	9	100	0	0		0	0	0
Reid mine	do	Transylvania, N. C.	6, 7	Brownish olive	80	Dendrite specks and spots of hematite with local triangular lattices.	Slightly clay-stained.	1	143	100	0	0		65	0	0
Renfro mine (lower cut).	Spruce Pine	Mitchell, N. C.	Washer	Deep yellowish green.	50	Sparse magnetite spots.	Garnet inclusions.	1	15	0	100	0		0	0	0
Rhoda mine	Franklin-Sylva	Jackson, N. C.	6	Cinnamon brown	0		Clay-stained; scattered green to reddish-brown specks.	1	34	100	0	0		0	0	0
Do	do	do	Washer	do	0		do	1	7	100	0	0				
Rice mine	do	do	6	Dark brownish olive.	0		Slightly clay-stained; dark-green specks; local very faint green mottling.	1	111	100	0	0		0	0	0
Do	do	do	Washer	do	0		do	1	15	100	0	0				
Rice mine	Shelby-Hickory	Cleveland, N. C.	7	Cinnamon brown	75	Sparse dendrite specks and spots of hematite near centers of some books.	Clay-stained	1	96	100	0	0		0	0	0
Do	do	do	Washer	do	100	do	do	1	9	100	0	0				
Richards prospect	Spruce Pine	Mitchell, N. C.	6	Green	100	Thin dendrite specks and spots of hematite.	do	1	24	100	0	0		0	0	0
Richland Balsam prospect.	Franklin-Sylva	Jackson, N. C.	Washer	Light brownish olive.	100	Magnetite specks and small spots near rims of books.	do	2	20	100	0	0		0	0	0
Rickman mine	do	Macon, N. C.	5½, 7	Cinnamon brown	0		do	1	55	100	0	0		0	0	0
Do	do	do	Washer	do	0		do	1	15	0	100	0				
Riddle, Jim, mine	Spruce Pine	Yancey, N. C.	6	Light cinnamon brown.	0		Local very pale vegetable stain.	1	28	100	0	0		0	0	0
Ridge mine	Franklin-Sylva	Jackson, N. C.	6	Light cinnamon brown, with streaks of pale brownish olive.	35	Specks and plates of hematite; some biotite(?) shreds.	Curdy brownish stain at centers of some books; rare green dendrite spots.	1	79	100	0	0		0	0	5
Ridgecrest prospect.	Spruce Pine	Mitchell, N. C.	Washer	Green	100	Abundant magnetite spots.	Clay- and iron-stained; garnet inclusions.	1	13	100	0	0		0	0	75
Ridgeway mine	Ridgeway-Sandy Ridge.	Henry, Va.	do	Yellowish to brownish olive.	0		Clay-stained	1	5	100	0	0				
Roaring Fork (Norman Mashburn, Smith) mine.	Franklin-Sylva	Macon, N. C.	6	Pinkish buff	Trace	Specks and small spots of magnetite in broad belts.		1	93	100	0	0		0	0	0
Roaringhole (Sheep Knob) mine.	do	Jackson, N. C.	6	Cinnamon brown	0		Clay-stained; rare tiny biotite flakes.	1	21	100	0	0	E-1 (1)	0	0	0

TABLE 10.—*General test data for mica specimens, arranged by lot and by mine or prospect*—Continued

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Type of mineral stain	Remarks	Electrical tests: Number of lots tested	Total number of pieces tested	Percent E-1	Percent E-2	Percent E-3	30-mil stack (number of stacks in parentheses)	Proportion of tested defects (to nearest 5 percent): Material with conducting substances	Material with cracks	Material with pinholes
Robinson, Charles, mine.	Spruce Pine	Yancey, N. C.	5, 5½, 6, 7.	Yellowish green to yellowish olive.	Trace	Specks and abundant thin triangular lattices of hematite.	Slightly clay-stained.	7	689	100	0	0	E-1 (6)	Trace	10	15
Do.	do	do	Washer	do	25	do	do	3	33	100	0	0		0	0	0
Robinson, Corb, mine.	do	do	5, 6, 7	Brownish olive	25	Scattered dendrite specks, spots, and triangular lattices of hematite.	Clay-stained	2	148	100	0	0		0	0	0
Rock mine	Franklin-Sylva	Jackson, N. C.	6	Pinkish buff to pale cinnamon brown.	0		Very slightly clay-stained.	1	42	100	0	0		0	0	0
Rock mine	Spruce Pine	Yancey, N. C.	5	Cinnamon brown.	20	Scattered dendrite specks and spots of hematite.	Slightly iron-stained; local green wisps of biotite(?).	1	73	100	0	0	E-1 (1)	0	0	0
Rocky Branch (McKay) mine.	Franklin-Sylva	Jackson, N. C.	Washer	do	40	Scattered specks of hematite and magnetite.		1	13	100	0	0		0	0	0
Rocky Face mine.	do	Macon, N. C.	3, 4, 5, 5½, 6, 7.	Cinnamon brown to dark brownish olive.	0		Pale-green mottling.	7	1,407	100	0	0	E-1 (3)	0	15	15
Rogers mine	do	Jackson, N. C.	6, 7	Cinnamon brown, grading locally into light yellowish olive.	25	Sparse magnetite specks and small spots.	Clay-stained; green mottling; rare brown dendrite specks.	3	93	100	0	0	E-1 (1)	0	0	0
Do.	do	do	Washer	do	10	do	do	1	5	100	0	0				
Roper, Bud, mine.	do	Macon, N. C.	6	Cinnamon brown.	0		Brown dendrite specks near centers of some books.	1	67	100	0	0		0	0	0
Do.	do	do	Washer	do	0		do	3	50	100	0	0		0	0	0
Rough Fork mine.	do	do	do	do	0		Clay-stained	1	11	100	0	0		0	0	0
Royalston, road cut out of, on road to Elberton.	Hartwell	Hart, Ga.	6	Pale brownish olive to cinnamon brown.	15	Rare magnetite spots and specks.	Clay- and iron-stained.	1	35	100	0	0		5	0	0
Ruby King (J.C.Hawkins) mine.	Ridgeway-Sandy Ridge.	Stokes, N. C.	6, 7	Cinnamon brown with streaks of yellowish olive.	30	Scattered specks and spots of magnetite.	Clay-stained; some pale-green mottling.	3	288	100	0	0	E-1 (2)	Trace	0	Trace
Do.	do	do	Washer	do	100	do	do	1	12	100	0	0				
Russell prospect	Franklin-Sylva	Macon, N. C.	6	Dark brownish olive.	50	Hematite specks and rare rows of specks in triangular lattices.	Scattered tiny green rodlike masses.	1	73	100	0	0		0	0	0
Do.	do	do	Washer	do	0	do	do	1	9	100	0	0				
Rutherford mines.	Amelia	Amelia, Va.	4, 5, 6, 7	Yellowish green and light brown.	0		Pale-green mottling.	2	549	100	0	0		0	Trace	0
Do.	do	do	Washer	do	0		do	1	11	100	0	0				
Rutherford No. 2 mine.	do	do	4, 5, 5½, 6.	Light brown to cinnamon brown.	0		Slightly clay-stained; local pale-green mottling.	3	276	100	0	0	E-1 (1)	0	0	0
Sally Knob mine.	Spruce Pine	Yancey, N. C.	6	Brownish olive	50	Rows of small dendrite spots of brown hematite with some faint triangular lattices.		1	55	100	0	0		50	0	0
Sanders, Doc, mine.	Franklin-Sylva	Macon, N. C.	Washer	Green to dull yellowish olive.	0		Narrow "A" reeves.	1	15	100	0	0		0	0	0

Saunders No. 2 mine.	Outlying Virginia.	Hanover, Va.	5, 5½, 6	Not determined	0		Sparse brown bursts.	2	241	100	0	0	E-1 (1)	0	0	10
Scism prospect	Shelby-Hickory	Cleveland, N. C.	5, 6, 7	Yellowish to brownish olive.	20	Scattered magnetite specks and spots.	Clay-stained	1	40	100	0	0	E-1 (1)	<5	15	25
Scrap mine	Hartwell	Hart, Ga.	6	Yellowish olive	100	Rows of magnetite specks and spots.	Clay-stained; very pale green mottling.	1	38	100	0	0		0	0	0
Self mine	Spruce Pine	Mitchell, N. C.	7	Light yellowish green.	0		Slightly clay-stained.	1	14	100	0	0		0	0	0
Self, E. R., (Old Neale) mine.	Shelby-Hickory	Gaston, N. C.	5, 6, 7	Pinkish buff	Trace	Rare magnetite spots and hematite dendrite spots and specks.	Clay- and iron-stained; rare brown bursts; sparse light-brown mottling.	5	383	100	0	0	E-1 (4)	0	0	0
Do.	do.	do.	Washer	do.	40	do.	do.	3	41	100	0	0				
Shakerig and Sleepy Hollow mines (in Bailey Mountain group).	Spruce Pine	Yancey, N. C.	6	Brownish olive	10	Sparse dendrite specks and spots of hematite and magnetite.	Very slightly clay-stained.	1	9	100	0	0		0	0	0
Do.	do.	do.	Washer	do.	40	do.	do.	2	20	100	0	0		0	0	0
Sheep Mountain mine.	Franklin-Sylva	Jackson, N. C.	5, 5½, 6, 7.	Yellowish olive	90	Scattered hematite dendrite specks and spots; much altered.	Much pale-green mottling; local green bursts; scattered zircon inclusions.	4	528	100	0	0	E-1 (1)	0	5	0
Do.	do.	do.	Washer	do.	85	do.	do.	2	23	100	0	0				
Shehan, John, (Gouge) mine.	Spruce Pine	Yancey, N. C.	5, 5½, 6	Cinnamon brown, with some dull yellowish olive.	<5	Sparse magnetite specks and lattices of brown hematite.	Rare green dendrite specks.	4	481	100	0	0	E-1 (2)	0	0	25
Shelby-Hickory district (localities unknown).	Shelby-Hickory	North Carolina	6, 7	Pinkish buff to cinnamon brown, with some yellowish olive.	20	Sparse dendrite specks and spots of hematite and specks of magnetite.	Clay-stained; rare brown bursts.	4	543	100	0	0		Trace	Trace	Trace
Do.	do.	do.	Washer	do.	50	do.	do.	1	12	100	0	0		0	0	30
Shell, Zolly, (Creek) mine.	Wilkes	Wilkes, N. C.	6, 7	Dull yellowish olive through dark brownish olive to cinnamon brown.	5	Rare dendrite specks of hematite.	Clay-stained; rare brown dendrite spots.	2	103	100	0	0	E-1 (1)	0	0	0
Do.	do.	do.	Washer	do.	50	do.	do.	1	17	100	0	0				
Shell Ridge mine	Franklin-Sylva	Jackson, N. C.	6	Cinnamon brown, with many areas of yellowish olive.	Trace	Rare magnetite and hematite specks and spots.	Clay-stained; some greenish to brownish mottling.	1	42	100	0	0		0	0	0
Do.	do.	do.	Washer	do.	Trace	do.	do.	1	13	13	0	0				
Shelton, G. R., mine.	Ridgeway-Sandy Ridge.	Stokes, N. C.	5, 6	Cinnamon brown, with streaks of pale brownish olive.	30	Scattered specks and spots of magnetite.	Slightly clay-stained; local large brown bursts.	1	40	100	0	0	E-1 (1)	0	0	0
Shepherd Knob (Boyd Knob) mine.	Franklin-Sylva	Macon, N. C.	6	Light cinnamon brown.	Trace	Thin limonite stripes in triangular lattices.	Slightly clay-stained; very pale green mottling.	3	291	100	0	0	E-1 (1)	0	0	5
Shiney mine	do.	Haywood, N. C.	6	Cinnamon brown	0		Slightly clay-stained; sparse pale-green mottling.	1	41	100	0	0	E-1 (1)	0	0	0
Do.	do.	do.	Washer	do.	0		do.	1	4	100	0	0				
Shotgun mine	do.	Macon, N. C.	6	Light cinnamon brown.	Trace	Rare magnetite specks and hematite dendrite specks and spots.	Clay-stained	1	13	100	0	0		0	0	0
Do.	do.	do.	Washer	do.	Trace	do.	do.	1	15	100	0	0				
Sigmon mine	Shelby-Hickory	Catawba, N. C.	6	Pinkish buff	0		Pale-green mottling; biotite intergrowths.	1	91	100	0	0	E-1 (1)	0	0	0
Silvers mine	Spruce Pine	Yancey, N. C.	5, 6	Light yellowish olive.	Trace	Tiny magnetite specks.		1	75	100	0	0	E-1 (1)	0	0	0
Silvers Ridge mine.	do.	Mitchell, N. C.	6, 7	Dark yellowish green.	do.	Sparse dendrite specks of hematite.	Pale-green mottling.	1	71	100	0	0		0	0	0
Do.	do.	do.	Washer	do.	15	do.	do.	1	11	100	0	0				

TABLE 10.—*General test data for mica specimens, arranged by lot and by mine or prospect*—Continued

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Type of mineral stain	Remarks	Electrical tests: Number of lots tested	Total number of pieces tested	Percent E-1	Percent E-2	Percent E-3	30-mil stack (number of stacks in parentheses)	Proportion of tested defects (to nearest 5 percent): Material with conducting substances	Material with cracks	Material with pinholes
Silvers Ridge prospect.	Spruce Pine	Mitchell, N. C.	Washer	Dark yellowish green to dark-brownish olive.	100	Large dendrite spots and blotches of hematite, with many tiny specks.		1	14	100	0	0		0	0	70
Sinkhole mine	do	do	3,4,5,5½, 6,7.	Cinnamon brown.	0		Slightly clay- and iron-stained; local pale-green mottling and green dendrite spots.	7	602	100	0	0	E-1 (5)	0	0	15
Do	do	do	Washer	do	0		do	2	21	100	0	0				
Siphon Hole mine	Franklin-Sylva	Macon, N. C.	6	Light cinnamon brown.	0		Clay-stained	1	63	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	0		do	1	5	100	0	0				
Skelton, J. M., prospect.	Hartwell	Elbert, Ga	6, 7	Light brownish olive to brown.	55	Scattered magnetite specks and locally abundant biotite flakes.	Clay- and iron-stained.	2	239	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	100	do		1	15	100	0	0				
Slagle mine	Franklin-Sylva	Macon, N. C.	6	Cinnamon brown and dull yellowish olive to brownish olive.	<5	Rare hematite specks and small spots.	Clay-stained; much brown to pale-green mottling; rare brownbursts.	1	43	100	0	0		0	0	0
Do	do	do	Washer	do	<5	do	do	1	8	100	0	0		0	0	0
Slagle-Drake mine.	do	do	5½, 6	Yellowish to brownish olive, with some brown.	Trace	Rare specks and spots of magnetite and hematite.	Clay-stained; curdy green to brown stain near centers of some books.	1	36	100	0	0		0	0	0
Do	do	do	Washer	do	Trace	do	do	1	12	100	0	0		0	75	50
Slaughter, J G., prospect.	Outlying North Carolina Piedmont.	Caswell, N. C.	7	Pale yellowish green to greenish olive.	100	Widespread dendrite spots and triangular lattices of hematite.	Clay-stained	1	112	100	0	0		75	0	0
Slippery Elm mine.	Spruce Pine	Avery, N. C.	3, 4, 5, 5½, 6, 7,	Dark yellowish to brownish olive with a little light green.	Trace	Rare wisps of biotite and dendrite specks of hematite.	Sparse brown bursts.	11	1,228	100	Trace	Trace	E-1 (5)	0	15	5
Do	do	do	Washer	do	5	do	do	3	41	100	0	0				
Slippery Elm mine, road cut below.	do	do	5½, 6, 7	Dark brownish olive.	10	Sparse iron oxide specks and spots.	Slightly clay-stained.	1	156	100	0	0		65	<5	5
Smith, Calhoun, mine.	do	Mitchell, N. C.	6	Green	Trace	Rare dendrite specks of hematite.	do	1	51	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	30	do	do	2	11	0	18	82				
Smith, Ernest, mine.	Ridgeway-Sandy Ridge.	Rockingham, N. C.	6, 7	Dark brownish olive.	95	Locally abundant dendrite specks and spots of hematite with some magnetite spots.	do	1	175	94	6			5	0	<5
Smith, Lissie, mine.	Spruce Pine	Mitchell, N. C.	3, 4	Yellowish olive	100	Heavy stain; hematite in dendrite spots and thin, extensive triangular lattices.	Local green dendrite spots.	1	3	0	0	100	E-1 (1)	100	0	0

Smith, Short Tom, (Ben Smith) mine.	Ridgeway-Sandy Ridge.	Rockingham, N. C.	2, 5, 6, 7	Dark yellowish olive.	Trace	Rare magnetite and hematite specks and spots.	Slightly clay-stained; very pale green mottling.	3	93	100	0	0	E-1 (1)	0	0	0
Smith store, road cut 1/10 mile south of.	Outlying Georgia	Troup, Ga	6	Yellowish olive	100	Abundant dendrite spots, blotches, and triangular lattices of hematite.	Clay-and iron-stained.	1	85	86	14	0		65	0	0
Do	do	do	Washer	do	100	do	do	1	7	0	100	0				
Smith Store prospect.	do	do	6, 7	do	100	Heavily stained with hematite dendrite spots and blotches.	do	1	149	100	0	0	E-1 (1)	100	0	0
Do	do	do	Washer	do	100	do	do	1	15	100	0	0				
Snake Den mine	Spruce Pine	Yancey, N. C	5, 5½, 6	Cinnamon brown	<5	Sparse magnetite specks.	Slightly clay-stained.	3	389	100	0	0	E-1 (2)	0	20	0
Soft Ridge mine	do	Mitchell, N. C	Washer	Dark yellowish olive.	25	Dendrite spots of hematite.		1	17	100	0	0		0	0	0
Spangler, D. H., prospects.	Shelby-Hickory	Cleveland, N.C	6, 7	Cinnamon brown	Trace	Rare magnetite and hematite specks.	Clay-stained	2	128	100	0	0	E-1 (1)	0	0	5
Spangler, T. N., (Ruben Spangler) prospects.	do	do	6, 7	Pinkish buff, with pale-greenish streaks.	0		Slightly clay-stained.	1	93	100	0	0	E-1 (1)	0	0	0
Sparks, Ken, mine.	Spruce Pine	Mitchell, N. C	Washer	Light yellowish green to brownish olive.	0		Clay-stained	1	14	100	0	0		0	0	75
Sparks, Rube, (Cook) mine.	do	do	5, 6	Dark yellowish green.	25	Scattered magnetite spots and hematite dendrite specks.	Rare curdy brown stain.	2	50	100	0	0	E-1 (2)	0	0	0
Do	do	do	Washer	do	70	do	do	1	19	100	0	0				
Spence mine	Franklin-Sylva	Jackson, N. C	6	Cinnamon brown	0		Clay-stained	1	75	100	0	0		0	0	0
Do	do	do	Washer	do	0		do	1	12	100	0	0				
Spencer mine	Ridgeway-Sandy Ridge.	Stokes, N. C	7	Light brown	Trace	Rare brown dendrite specks of hematite.	Clay-stained; local pale-green mottling.	1	138	100	0	0		0	0	0
Spruce Pine district (localities unknown).	Spruce Pine	North Carolina	4, 5, 6	Brownish olive	0			1	187	100	0	0	E-1 (1)	0	50	100
Spruce Ridge mine.	Franklin-Sylva	Haywood, N. C	6, 7	Cinnamon brown	15	Sparse biotite shreds and rare dendrite specks of hematite.	Slightly clay-stained; very pale green mottling.	2	118	100	0	0		0	0	0
Do	do	do	Washer	do	35	do	do	1	9	100	0	0				
Stamey mine	do	Macon, N. C	5, 6	Dark yellowish olive to brownish olive.	100	Large blotches and laths of black to reddish-brown hematite, with some magnetite.	Rare faint "A" reeves.	1	143	100	0	0	E-1 (1)	15	0	30
Do	do	do	Washer	do	100	do	do	1	15	100	0	0				
Steele mine	Ridgeway-Sandy Ridge.	Stokes, N. C	5, 6, 7	Cinnamon brown, with streaks of yellowish olive.	5	Scattered dendrite specks and spots of hematite, with a little magnetite.	Clay-and iron-stained; local green mottling.	3	404	100	0	0	E-1 (1)	0	0	0
Stevens Rock (Marshall, Sullivan, McKinney) mine.	Thomaston-Barnesville.	Upson, Ga	5, 6	Pale cinnamon brown.	<5	Sparse shreds of biotite, some in triangular patterns.	Slightly clay-stained; much green mottling; rare brown bursts; biotite and pyrite inclusions.	1	68	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	<5	do	do	1	20	100	0	0				
Stillwell mine	Franklin-Sylva	Jackson, N. C	6, 7	Cinnamon brown to dark brownish olive.	Trace	Rare magnetite specks and spots.	Sparse green mottling; rare small biotite intergrowths.	1	110	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	Trace	do	do	1	12	100	0	0		0	0	0
Stringfield mine	do	Haywood, N. C	6	Dark brownish olive.	50	Hematite dendrite spots and blotches with some triangular lattices.	Slightly clay-stained.	1	110	100	0	0	E-1 (1)	30	0	0
Do	do	do	Washer	do	100	do	do	1	8	100	0	0				
Stroud, Lax, mine	Shelby-Hickory	Rutherford, N.C	6	Pinkish buff	<5	Rare magnetite specks.	Clay-and iron-stained.	1	36	100	0	0		0	0	0
Stroud, T. C., prospects.	do	Cleveland, N. C	6	Cinnamon brown	Trace	Sparse iron oxide specks.	Clay-stained	1	36	100	0	0		0	0	0
Sugarloaf Creek mine.	Franklin-Sylva	Jackson, N. C	5	do	Trace	Rare hematite and magnetite specks	Rare pale vegetable stain.	1	56	100	0	0	E-1 (1)	0	0	0

TABLE 10.—*General test data for mica specimens, arranged by lot and by mine or prospect*—Continued

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Type of mineral stain	Remarks	Electrical tests: Number of lots tested	Electrical tests: Total number of pieces tested	Electrical tests: Percent E-1	Electrical tests: Percent E-2	Electrical tests: Percent E-3	Electrical tests: 30-mil stack (number of stacks in parentheses)	Proportion of tested defects (to nearest 5 percent): Material with conducting substances	Proportion of tested defects (to nearest 5 percent): Material with cracks	Proportion of tested defects (to nearest 5 percent): Material with pinholes
Sugarloaf Mountain prospects.	Franklin-Sylva	Jackson, N. C.	Washer	Cinnamon brown with streaks of dull yellowish olive.	75	Magnetite specks and spots, with some hematite dendrite specks.	Clay-and iron-stained; zircon inclusions.	1	12	100	0	0		0		0
Summer mine	Spruce Pine	Mitchell, N. C.	6	Not determined	0			2	200	100	0	0	E-1 (1)	0	0	<5
Swannanoa (Beede Smith) mine.	Buncombe	Buncombe, N. C.	5½, 6	Cinnamon brown	0			2	257	100	0	0		0	0	5
Swell prospect	Franklin-Sylva	Macon, N. C.	6, 7	Brown	Trace	Rare black to dark-brown iron oxide specks.	Clay-stained; curdy brown stain at centers of some books.	1	14	100	0	0		0	0	0
Do.	do	do	Washer	do	Trace	do	do	1	13	100	0	0				
Sycamore (Roach) mine.	Outlying Virginia	Pittsylvania, Va.	6	Yellowish olive	100	Abundant hematite dendrite specks, spots, and blotches; much triangular lattice.	Slightly clay-stained.	1	29	100	0	0		100	0	0
Tallant prospect	Shelby-Hickory	Catawba, N. C.	6	Cinnamon brown	20	Scattered iron oxide specks and spots.	Clay-stained	1	152	100	0	0		0	0	20
Tantrough mine	Spruce Pine	Yancey, N. C.	6	Brownish olive	Trace	Very rare black magnetite specks.	Slightly clay-stained.	1	14	100	0	0		0	0	0
Taylor, Fate, mine.	do	Avery, N. C.	6, 7	do	60	Abundant dendrite spots, specks, and blotches of hematite.	Local brown bursts.	1	174	89	9	2	E-1 (1)	75	0	0
Do.	do	do	Washer	do	100	do	do	1	5	100	0	0				
Taylor, Fred, prospect.	Franklin-Sylva	Macon, N. C.	6	Dark brown	100	Abundant hematite blotches and shreds.		1	92	100	0	0		75	0	0
Do.	do	do	Washer	do	100	do		1	13	100	0	0				
Taylor, Nettie, mine.	Amelia	Amelia, Va.	6, 7	Yellowish olive to cinnamon brown.	0	Rare magnetite specks.	Clay-stained; pale-green mottling.	2	308	100	0	0	E-1 (1)	0	0	0
Do.	do	do	Washer	do	50	do	do	2	22	100	0	0				
Tennessee Creek mine.	Franklin-Sylva	Jackson, N. C.	5	Yellowish olive	100	Heavy hematite stain; dendrite spots and triangular lattices.		1	76	100	0	0	E-1 (1)	0	70	0
Thorne Mountain Northeast mine.	do	Macon, N. C.	5, 6	Cinnamon brown	Trace	Rare tiny black specks.	Sparse dark-green dendrite spots.	1	115	100	0	0	E-1 (1)	0	0	0
Do.	do	do	Washer	do	Trace	do	do	1	5	100	0	0				
Thorne Mountain Southwest mine.	do	do	6	do	Trace	do	Slightly clay-stained; sparse green mottling.	1	18	100	0	0		0	0	0
Thunder Knob mine.	Buncombe	McDowell, N. C.	5, 5½, 6	do	10	Scattered hematite blotches and rare magnetite specks and spots.	Slightly clay-stained; local green mottling.	2	213	100	0	0	E-1 (2)	0	0	0
Do.	do	do	Washer	do	50	do	do	1	17	100	0	0				
Tilley mine	Franklin-Sylva	Jackson, N. C.	5, 5½, 6, 7.	Deep brownish olive.	0		Dark-green dendrite specks and green to brown curdy stain, especially near centers of some books; green mottling; sparse	14	2,532	100−	Trace	0	E-1 (10)	<5	<5	10

							reddish-brown bursts and dendrite specks.									
Do	do	do	Washer	do	0		do	3	28	100	0	0				
Tipton mine	Buncombe	Buncombe, N. C.	6	Cinnamon brown	Trace	Rare hematite dendrite spots and specks.	Clay- and iron-stained; local pale-brownish mottling.	1	116	100	0	0		0	0	0
Do	do	do	Washer	do	10	do	do	1	12	100	0	0				
Tolley Bent (Tolley Bend) mine.	Spruce Pine	Yancey, N. C.	5, 5½, 6	Brownish olive, with streaks of green.	Trace	Rare small spots of magnetite.	Slightly clay-stained; rare reddish-brown bursts.	3	344	100	0	0	E-1 (2)	0	0	<5
Do	do	do	Washer	do	Trace	do	do	2	30	100	0	0		0	0	0
Toy (Tustin, Moody) mine.	Franklin-Sylva	Jackson, N. C.	6	Light cinnamon brown.	0		Local green mottling.	1	35	100	0	0		0	0	0
Tunnel mine	do	Rabun, Ga.	4, 5, 6	Yellowish to brownish olive.	100	Dendrite spots and blotches and broad triangular lattices of hematite.	Slightly clay-stained.	7	1,216	77	20	3	E-1 (5); E-2 (1); E-3 (1).	40	Trace	5
Turkey Knob (Passamore) mine.	do	Macon, N. C.	6	Pale yellowish olive to very pale cinnamon brown.	10	Broad belts of magnetite specks and spots.	Pale-brown mottling; rare brown bursts.	1	42	100	0	0		0	0	0
Do	do	do	Washer	do	15	do	do	1	9	100	0	0				
Turkey Nest mine.	do	do	5, 5½, 6, 7.	Light cinnamon brown, with pale-greenish streaks.	70	Magnetite spots and hematite laths and dendrite specks.	Clay-stained; some green mottling.	3	513	100	0	0	E-1 (1)	0	5	0
Do	do	do	Washer	do	80	do	do	2	30	100	0	0				
Turner prospect	Hartwell	Elbert, Ga.	6	Yellowish olive	70	Rectangular lattices of curdy green to brown stain (hydrous iron oxides?).	Clay- and iron-stained.	2	123	100	0	0		0	0	5
Tustin mine	Franklin-Sylva	Jackson, N. C.	Washer	Light cinnamon brown, with tinges of yellowish olive.	<5	Rare specks of magnetite.	Clay-stained; local greenish mottling.	1	15	100	0	0		0	0	0
Twiggs mine	Spruce Pine	Mitchell, N. C.	5, 6	Yellowish to brownish olive.	Trace	Rare magnetite and hematite specks.		1	127	100	0	0	E-1 (1)	0	0	0
U. S. Highway 220, prospect on.	Ridgeway-Sandy Ridge.	Rockingham, N. C.	6, 7	do	0		Clay-stained	1	172	100	0	0		0	0	<5
Unknown mine	Outlying Virginia.	Charlotte, Va.	5, 6, 7	Brownish olive	75	Dendrite specks and spots of hematite, with broad triangular lattices.	Slightly clay-stained.	1	128	100	4	1	E-1 (1)	50	0	25
Unknown mine	Unknown	Georgia	5, 5½, 6	Yellowish olive	15	Dendrite spots of hematite.	Clay-stained	1	114	95	4	1	E-1 (1)	10	0	15
Unknown mine	do	do	6, 7	Cinnamon brown	0		Clay- and iron-stained.	1	72	100	0	0	E-1 (1)	25	0	0
Unknown mine	do	Virginia	6, 7	Brownish olive and cinnamon brown.	0		do	1	30	100	0	0	E-1 (1)	0	0	0
Unnamed prospect.	Ridgeway-Sandy Ridge.	Stokes, N. C.	6, 7	Cinnamon brown	40	Scattered specks of iron oxide.	Clay-stained	1	127	100	0	0		0	0	0
Upper Crabtree prospect.	Spruce Pine	Mitchell, N. C.	Washer	Yellowish olive	50	Dendrite spots and blotches of hematite.		1	8	100	0	0		0		25
Upper Raby mine.	Franklin-Sylva	Macon, N. C.	6	Pale cinnamon brown.	0		Slightly clay- and iron-stained; rare brown and green bursts.	1	83	100	0	0		0	0	0
Upper Sugar Creek Gap prospect.	do	Jackson, N. C.	Washer	do	0		Heavily clay- and iron-stained; local green bursts.	1	8	100	0	0		0		0
Vance, Freel, (Jose Comina) mine.	Spruce Pine	Avery, N. C.	5½, 6	Yellowish to brownish olive.	100	Abundant dendrite spots and blotches of hematite, with narrow, curdy, triangular lattices.		2	169	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	100	do		1	9	100	0	0				
Vaughan mine	Amelia	Amelia, Va.	do	Brown	100	Rare specks of hematite and biotite.	Slightly clay-stained.	1	12	100	0	0		0	0	0

TABLE 10.—*General test data for mica specimens, arranged by lot and by mine or prospect*—Continued

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Type of mineral stain	Remarks	Electrical tests: Number of lots tested	Total number of pieces tested	Percent E-1	Percent E-2	Percent E-3	30-mil stack (number of stacks in parentheses)	Proportion of tested defects (to nearest 5 percent): Material with conducting substances	Material with cracks	Material with pinholes
Vaughan, Early, mine.	Thomaston-Barnesville.	Lamar, Ga.	5, 5½, 6	Pale pinkish buff, with light-greenish streaks.	<5	Sparse magnetite spots and specks.	Clay-and iron-stained; rare green mottling; rare brown bursts.	5	494	100	0	0	E-1 (3)	0	0	0
Do.	do.	do.	Washer	do.	50	do.	do.	1	12	100	0	0				
Verdell mine.	Franklin-Sylva.	Macon, N. C.	6	Dark yellowish green to brownish olive.	100	Dendrite spots and blotches of hematite, with triangular lattices; rare magnetite.		1	91	100	0	0	E-1 (1)	75	0	0
Vern Muse prospect.	Spruce Pine.	Mitchell, N. C.	7	Brownish olive.	30	Dendrite specks of hematite.	Rare green bursts.	1	31	100	0	0		0	0	0
Wagon Road Gap prospect.	Franklin-Sylva.	Transylvania, N. C.	6	Pale yellowish olive.	40	Scattered very thin dendrite spots of hematite.	Slightly clay-stained; local pale-green mottling.	1	146	100	0	0		0	0	0
Warlick, Clyde, mine.	Shelby-Hickory.	Cleveland, N. C.	6, 7	Pinkish buff to cinnamon brown with pale-greenish streaks.	<5	Rare hematite dendrite specks and spots; scattered wisps of biotite.	Clay-stained; biotite intergrowths.	2	110	100	0	0		0	0	0
Do.	do.	do.	Washer	do.	55	do.	do.	1	9	100	0	0				
Waterhole mine.	Hartwell.	Hart, Ga.	5	Pale brown to brownish olive.	0		Clay-and iron-stained.	1	45	100	0	0	E-1 (1)	0	0	0
Wayehutta Clay (Weary Hut, Worry Hut) mine.	Franklin-Sylva.	Jackson, N. C.	6	Cinnamon brown.	0		Slightly clay-stained.	1	18	100	0	0		0	0	0
Weathers mine.	Shelby-Hickory.	Cleveland, N. C.	6	Pinkish buff, with some pale yellowish olive.	0		Clay-, iron-, and manganese-stained.	2	180	100	0	0		0	0	0
Do.	do.	do.	Washer	do.	0		do.	1	15	100	0	0				
Webb mine.	do.	do.	6, 7	Cinnamon brown, with pale-greenish streaks.	15	Rows of magnetite specks, spots, and laths; scattered small plates and wisps of biotite.	Clay-stained; local pale-brownish mottling.	2	234	100	0	0	E-1 (1)	0	0	0
Do.	do.	do.	Washer	do.	100	do.	do.	1	15	100	0	0				
Welch mine.	Franklin-Sylva.	Macon, N. C.	5½, 6	Cinnamon brown.	<5	Rare hematite dendrite spots and blotches.	Clay-stained; pale-green mottling and rare dark-green bursts; curdy brown stain at centers of some books.	1	21	100	0	0	E-1 (1)	0	0	0
Westall mine (on Colberts Ridge).	Spruce Pine.	Yancey, N. C.	5, 6	Light cinnamon brown.	Trace	Rare black magnetite and hematite specks.	Slightly clay-stained and iron-stained; faint pale-green to brown curdy stain.	2	41	100	0	0	E-1 (1)	0	0	0
Do.	do.	do.	Washer	do.	Trace	do.	do.	1	8	100	0	0				
Wetmore prospect.	Franklin-Sylva.	Jackson, N. C.	5, 6	Pale cinnamon brown.	0			1	20	100	0	0	E-1 (1)	0	0	0

White Peak No. 1 (Purcell, Miller) mine.	Outlying Virginia.	Powhatan, Va.	6	Cinnamon brown.	0		Clay-stained	3	122	100	0	0	E-1 (2)	0	0	0
Do	do	do	Washer	do	0		do	2	26	100	0	0				
White Rock mine.	Spruce Pine	Avery, N. C.	6, 7	Pale cinnamon brown.	0			1	17	100	0	0	E-1 (1)	0	0	0
Wildes, Jud, prospect.	Franklin-Sylva	Macon, N. C.	6	do	0		do	1	15	100	0	0		0	0	0
Wilkes mine	do	Jackson, N. C.	Washer	Cinnamon brown.	0		do	1	9	100	0	0		0	0	0
Williams, Bud, mine.	do	do	6, 7	Light cinnamon brown.	0		Clay-stained; heavily mottled in green and brown; rare brown bursts.	1	73	100	0	0		0	0	0
Williamson mine.	Shelby-Hickory	Cleveland, N. C.	5, 6, 7	Cinnamon brown with streaks of light yellowish olive.	40	Sparse rows of magnetite spots and laths; rare dendrite specks and spots of hematite.	Clay-stained; local curdy brown stain.	3	723	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	60	do	do	1	15	0	100	0				
Willis prospect	Spruce Pine	Mitchell, N. C.	do	Brownish olive	100	Fuzzy triangular lattices of hematite, other iron oxides, and green biotite.		1	8	100	0	0		0	0	0
Willis Shanty mine.	do	Yancey, N. C.	5½, 6	Cinnamon brown.	20	Dendrite specks and irregular smears of hematite.		3	354	100	0	0	E-1 (2)	0	0	0
Wilson prospect (in Cashiers Valley).	Franklin-Sylva	Jackson, N. C.	6	Light brownish olive.	0		Clay-stained; curdy brown stain at centers of some books.	1	43	100	0	0	E-1 (1)	0	0	75
Wilson, Cleve, mine.	do	do	Washer	Brownish olive to pale cinnamon brown.	40	Small dendrite spots of hematite.	Local curdy greenish to brownish stain.	1	11	100	0	0		0	0	0
Wilson, Shirley, mine.	do	do	6	Dark brown	0		Pale-green mottling; rare tiny green bursts.	1	14	100	0	0	E-1 (1)	0	0	0
Wilson, W. T., prospect.	do	Haywood, N. C.	6	Cinnamon brown, with greenish streaks.	0		Rare tiny brown dendrite specks.	1	181	100	0	0	E-1 (1)	0	0	0
Winding Stair mine.	do	Macon, N. C.	6	Brownish olive	75	Magnetite spots and abundant dendrite spots and blotches of hematite.	Dark-green dendrite spots; some green mottling.	1	41	100	0	0		0	0	0
Do	do	do	Washer	do	80	do	do	1	6	100	0	0				
Winecoff mine	do	do	do	Cinnamon brown.	0		Clay-stained; local heavy brown mottling and bursts.	1	8	100	0	0		0	0	0
Wingo mine	Amelia	Amelia, Va.	6, 7	Light brownish olive to brown.	0		Rare pale-green biotite wisps.	1	112	100	0	0		0	0	0
Wiseman No. 2 (New) mine.	Spruce Pine	Mitchell, N. C.	5, 6, 7	Yellowish to brownish olive.	Trace	Rare dendrite spots and specks of hematite.	Rare brown to dark-green bursts and dendrite spots.	2	106	100	0	0	E-1 (2)	0	0	0
Do	do	do	Washer	do	<5	do	do	2	18	100	0	0				
Wiseman, Honey Waits, mine.	do	Avery, N. C.	6	Brown	50	Scattered biotite plates and wisps, with some hematite dendrite specks.	Clay-stained	1	19	100	0	0	E-1 (1)	0	0	0
Do	do	do	Washer	do	100	do	do	1	9	100	0	0				
Wiseman, W. W., mine.	do	Mitchell, N. C.	6	Yellowish olive	100	Very heavy triangular lattice of hematite dendrite spots.		1	28	96	4	0		100	0	0
Wolf Ridge mine.	do	Avery, N. C.	5, 6, 7	Cinnamon brown.	5	Scattered specks and spots of magnetite.	Clay-stained; local curdy brown stain.	3	184	100	0	0	E-1 (3)	0	0	0
Do	do	do	Washer	do	50	do	do	3	33	100	0	0				
Wolfden prospect.	do	Mitchell, N. C.	do	Yellowish olive	0		Clay-stained	1	11	100	0	0		0	0	0
Wolfden North prospect.	do	do	6	Brownish olive	Trace	Very rare magnetite and hematite specks.	Slightly clay-stained; pale vegetable stain.	1	14	100	0	0		0	0	0

TABLE 10.—*General test data for mica specimens, arranged by lot and by mine or prospect*—Continued

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Type of mineral stain	Remarks	Electrical tests: Number of lots tested	Total number of pieces tested	Percent E-1	Percent E-2	Percent E-3	30-mil stack (number of stacks in parentheses)	Proportion of tested defects (to nearest 5 percent): Material with conducting substances	Material with cracks	Material with pinholes
Wood (Brown's Coward Mountain) mine.	Franklin-Sylva	Jackson, N. C.	6	Yellowish olive	100	Abundant trigonal dendrite spots of hematite.	Local heavy green mottling.	1	40	100	0	0		0	0	0
Wood (Gully, Lon Allen) mine.	Hartwell	Hart, Ga.	6	Pinkish buff	0		Clay-and iron-stained.	1	24	100	0	0	E-1 (1)	0	0	0
Woods (Chastine Creek, Frady Creek) mine.	Franklin-Sylva	Jackson, N. C.	5	Dark brown	Trace	Rare black iron oxide spots and specks.	Sparse dark-brown dendrite specks.	1	78	100	0	0	E-1 (1)	0	0	0
Do.	do.	do.	Washer	do.	Trace	do.	do.	3	32	100	0	0		0	0	10
Woodward, Tyler, mine.	do.	do.	6	Pale cinnamon brown.	0		Clay-stained; pale vegetable stain.	1	78	100	0	0		0	0	0
Do.	do.	do.	Washer	do.	0		do.	1	8	100	0	0				
Wright prospect	Shelby-Hickory	Cleveland, N. C.	7	Cinnamon brown and light yellowish olive.	Trace	Rare dendrite specks of hematite.	Clay-stained	1	112	100	0	0		0	0	0
Do.	do.	do.	Washer	do.	40	do.	do.	1	7	100	0	0				
Yarboro No. 1 (Old Milton) mine.	Outlying North Carolina Piedmont.	Caswell, N. C.	7	Yellowish green to light brownish olive.	50	Hematite dendrite spots and blotches, with some thin lattices.	Slightly clay-stained.	1	86	100	0	0		50	0	0
Young mine	Outlying Virginia.	Bedford, Va.	5, 6	Dark brown to cinnamon brown.	25	Scattered laths and wisps of biotite, with some large magnetite spots.	do.	1	27	100	0	0	E-1 (1)	0	0	0
Do.	do.	do.	Washer	do.	100	do.	do.	1	8	100	0	0				
Young mine (near Harding mine).	Spruce Pine	Yancey, N. C.	5	Brownish olive to cinnamon brown.	50	Sparse hematite spots and shreds and rare magnetite spots.	Clay-stained; much green mottling; small dark-green dendrite spots.	1	44	100	0	0	E-1 (1)	0	0	0
Do.	do.	do.	Washer	do.	50	do.	do.	1	7	100	0	0				
Young prospect	do.	Mitchell, N. C.	do.	Green	0		Clay-stained; inclusions of zoisite and thulite.	1	11	100	0	0		0	0	50
Young, George, mine.	do.	do.	6	Yellowish to dark brownish olive.	Trace	Scattered sparse dendrite specks and spots of hematite.		1	9	100	0	0	E-1 (1)	0	0	0
Do.	do.	do.	Washer	do.	<5	do.		2	30	63	37	0		0	0	20
Young, Josh, mine.	do.	Yancey, N. C.	do.	Yellowish olive	Trace	Sparse dendrite specks of hematite.		1	15	100	0	0		0		0
Young, Noah, mine.	Shelby-Hickory	Burke, N. C.	6	Light pinkish buff with streaks of pale brown and greenish brown.	0		Heavily clay- and iron-stained.	1	65	100	0	0		0	0	0
Young, S. S., mine.	Spruce Pine	Mitchell, N. C.	Washer	Yellowish green	100	Dendrite spots and thin triangular lattices of hematite.	Clay-stained	1	8	100	0	0		0	0	0
Young, Wilt, mine.	do.	Yancey, N. C.	do.	Brownish olive	Trace	Rare magnetite and hematite specks.	Rare green dendrite spots.	1	11	100	0	0		0	0	0
Young, Zack, (Branch) mine.	do.	Mitchell, N. C.	6	do.	Trace	Rare tiny hematite specks.	Very pale vegetable stain; rare green dendrite spots.	1	12	100	0	0	E-1 (1)	0	0	0

Young, Zeph, mine group.	do	Yancey, N. C.	5, 6	Yellowish to brownish olive.	Trace	Rare magnetite specks and spots.	Locally abundant vegetable stain and green biotite shreds; garnet inclusions.	2	81	100	0	0	E-1 (1)	0	0	5
Do	do	do	Washer	do	Trace	do	do	1	12	100	0	0				
Young, Zeph and Allen, mines (in Zeph Young group).	do	do	7	do	20	Scattered magnetite and hematite spots.	Sparse green shreds of biotite.	1	137	100	0	0		0	0	0
Zachary, Hal, mine.	Franklin-Sylva	Macon, N. C.	7	Brown with some pale brownish olive.	<5	Rare dendrite specks and spots of hematite.	Clay-stained; curdy brown stain at centers of some books.	1	40	100	0	0		0	0	0
Do	do	do	Washer	do	<5	do	do	1	9	100	0	0				
Zoom mine	do	do	do	Pinkish buff	0		Slightly clay-, iron-, and manganese-stained.	1	11	100	0	0		0	0	100
SPECIMENS FROM SOURCES OUTSIDE THE SOUTHEASTERN STATES																
Cribbenville mine	Petaca	Rio Arriba, N. Mex.	1, 2, 3, 4, 5.	Light yellowish green and yellowish to brownish olive.	<5	Rare hematite dendrite specks and triangular lattices.		2	35	100	0	0		0	0	0
Globe mine	do	do	4, 5, 6	Light yellowish green.	Trace	Rare tiny magnetite and hematite specks.		1	17	100	0	0		0	0	0
Do	do	do	Washer	do	30	do		1	9	100	0	0				
Kiawa mine	do	do	3	Light yellowish green to yellowish olive.	0			1	4	100	0	0		0	0	0
New Hampshire mica (localities unknown).		New Hampshire	4	Yellowish olive	100	Dendrite spots and blotches of hematite with heavy triangular lattices.	Rare pale-green mottling.	1	20	0	85	15		5	0	5
Saunders mine		do	5	Pinkish buff	0			1	211	100	0	0		0	0	0
South Dakota mica (localities unknown).		South Dakota	3, 4	do	<5	Sparse magnetite specks and spots.	Air-stained; some green mottling.	1	50	100	0	0		0	10	15

TABLE 11.—*Results of electrical tests of mica samples, from specific mines or deposits, that include material of E-2 or E-3 quality*

Name of mine or prospect	District	County and State	Type of material	Proportion of material with mineral stain (to nearest 5 percent)	Number of pieces tested	Percent E-2	Percent E-3	Proportion of tested defects (to nearest 5 percent)		
								Material with conducting substances	Material with cracks	Material with pinholes
Autrey, Al, mine	Spruce Pine	Mitchell, N. C.	Washer	20	100	100	0	0	----------	25
Benfield, Byard, mine	do	Avery, N. C.	do	0	21	8	0	0	----------	0
Black Dixie mine (in Bailey Mountain group).	do	Yancey, N. C.	do	0	12	42	0	0	----------	0
Blanton prospect	Franklin-Sylva	Jackson, N. C.	do	100	8	100	0	0	----------	0
Blanton, Cliff, mine	Shelby-Hickory	Cleveland, N. C.	do	35	81	6	0	0	----------	0
Boone, Nelson, mine	Spruce Pine	Yancey, N. C.	do	50	7	100	0	0	----------	0
Buchanan, Henry, prospects.	Franklin-Sylva	Jackson, N. C.	do	35	17	29	18	0	----------	0
Buchanan, Jim, prospects.	Spruce Pine	Mitchell, N. C.	do	25	9	100	0	0	----------	10
Campbell mine	Shelby-Hickory	Cleveland, N. C.	6	20	89	60	0	0	0	0
Do	do	do	Washer	100	7	100	0	0	----------	0
Carolina Mineral Co. No. 6 mine.	Spruce Pine	Mitchell, N. C.	do	100	18	0	100	0	----------	0
Case mine	do	do	do	100	16	44	0	0	----------	Trace
Chalk Mountain prospect.	do	do	do	0	11	55	0	0	----------	0
Corn mine	do	Avery, N. C.	3–7	65	842	0	2	0	0	0
Cox, Wood, mine	do	Mitchell, N. C.	Washer	100	8	100	0	0	----------	0
Crabtree No. 1 (Wildcat) mine.	do	do	do	5	63	19	0	0	----------	0
Crabtree Summit prospect.	do	do	5, 6	100	6	67	33	100	0	0
Crews No. 1 prospect	Outlying Virginia	Charlotte, Va.	5–7	100	185	3	11	65	0	0
Emmons Knob mine	Spruce Pine	Avery, N. C.	5	5	48	2	0	0	0	0
Estatoe Northeast (Mossy Rock) prospect.	do	Mitchell, N. C.	Washer	60	5	100	0	0	----------	0
Furlow Gap (Farlow Gap) mine.	Franklin-Sylva	Transylvania, N. C.	5–6	100	184	35	3	0	0	0
Googrock mine	Spruce Pine	Yancey, N. C.	Washer	65	20	35	0	0	----------	0
Gouge Falls prospect	do	Mitchell, N. C.	do	100	3	100	0	0	----------	0
Hogg mine (wall-zone mica).	Outlying Georgia	Troup, Ga.	5–7	100	410	41	9	100	<5	<5
Hootowl mine	Spruce Pine	Mitchell, N. C.	4–6	100	248	2	0	45	0	0
Hoppus Northeast mine	do	do	Washer	5	8	100	0	0	----------	0
Irby Cut mine	do	Yancey, N. C.	do	0	7	100	0	0	----------	0
Isinglass Hill mine	Outlying North Carolina Piedmont.	Rutherford, N. C.	6, 7	100	94	13	0	100	0	5
Jasper mine	Franklin-Sylva	Jackson, N. C.	3–7	Trace	1,112	4	0	0	10	<5
Jimmy mine (in Archie Norman group).	Shelby-Hickory	Cleveland, N. C.	Washer	Trace	7	100	0	0	----------	50
Kell mine	Franklin-Sylva	Rabun, Ga.	do	100	30	50	0	0	----------	0
Knight mine	Ridgeway-Sandy Ridge.	Rockingham, N. C.	3–7	90	15,987	23	16	5	10	15
Little Spring mine	Franklin-Sylva	Macon, N. C.	Washer	0	7	100	0	0	----------	0
Locust Rough (B. T. Snopp) mines.	Spruce Pine	Yancey, N. C.	5, 6	100	85	7	5	0	5	0
McKinney prospect	do	Mitchell, N. C.	Washer	100	12	0	25	0	----------	100
Mica Hill mine	Alabama	Tallapoosa, Ala.	5–7	65	849	6	0	5	<5	<5
New Wolff (Wolff, Old Wolff) mine.	Franklin-Sylva	Jackson, N. C.	5–7	10	113	0	3	5	0	0
Norton mine	do	Rabun, Ga.	3–7	85	1,269	2	14	80	Trace	<5
Ollis, Jake, mine	Spruce Pine	Avery, N. C.	5, 6	70	150	6	3	10	0	Trace
Potato Hill mine	do	Mitchell, N. C.	Washer	10	15	47	0	0	----------	0
Pyatte, Zeb, mine	do	Avery, N. C.	6	95	200	4	3	100	<5	<5
Renfro mine	do	Mitchell, N. C.	Washer	50	15	100	0	0	----------	0
Rickman mine	Franklin-Sylva	Macon, N. C.	do	0	15	100	0	0	----------	0
Road cut	Outlying Georgia	Troup, Ga.	6	100	83	14	0	65	0	0
Do	do	do	Washer	100	7	100	0	0	----------	0
Smith, Calhoun, mine	Spruce Pine	Mitchell, N. C.	do	30	11	18	82	0	----------	0
Smith, Ernest, mine	Ridgeway-Sandy Ridge.	Rockingham, N. C.	6, 7	95	175	6	0	5	0	<5
Smith, Lissie, mine	Spruce Pine	Mitchell, N. C.	3, 4	100	3	0	100	100	0	0
Taylor, Fate, mine	do	Avery, N. C.	6, 7	60	174	9	2	75	0	0
Tunnel mine	Franklin-Sylva	Rabun, Ga.	4–6	100	1,216	20	3	40	0	5
Unknown mine	Outlying Virginia	Charlotte, Va.	5–7	75	128	4	1	50	0	25
Unknown mine	Unknown	Georgia	5–6	15	114	4	1	10	0	15
Williamson mine	Shelby-Hickory	Cleveland, N. C.	Washer	60	15	100	0	0	----------	0
Wiseman, W. W., mine	Spruce Pine	Mitchell, N. C.	6	100	28	4	0	100	0	0
Young, George, mine	do	do	Washer	<5	30	37	0	0	----------	20
SAMPLES FROM SOURCES OUTSIDE THE SOUTHEASTERN STATES										
New Hampshire mica (localities unknown).	----------	New Hampshire	4	100	20	85	15	5	0	5

TESTS OF VISUALLY QUALIFIED MICA

Through the courtesy of W. J. Alexander, Southern District Manager, 354 lots of prepared and qualified mica were loaned by the Colonial Mica Corporation for electrical testing. This material had been processed and qualified by visual methods in Asheville, N. C. The test data for 243 lots taken from the production line of the Colonial Mica Corporation shops in 1945 are shown in table 12. Twelve of these had been qualified by careful inspection as No. 1; 19 as No. 2; 208 as No. 2 inferior; 2 as No. 3; and 2 as No. 1 and No. 2.

The results of electrical testing were in marked contrast to this grouping. All pieces of mica in all the lots registered E-1 on the Q-meter dial, and nearly all were in the uppermost part of the E-1 range. On the other hand, the spark testing revealed pinholed material in 64 percent of the lots, hair cracks in nearly 7 percent of the lots, and conducting inclusions in one lot. Pinholes and cracks were present in 12.6 percent of the test pieces, yet none of these flaws was readily observable with the naked eye. This high proportion of blemished sheets evidently is unusual, as only 3.35 percent of the 237,790 pieces tested during the entire program contained pinholes or hair cracks.

Another series of mica samples had been prepared, qualified, taken from the production line, and placed in storage by the Colonial Mica Corporation in 1943. These samples were retested by the electrical methods, and the results of the tests are compared with those of the earlier grading in table 13. Thirty-nine lots of green mica yielded only 10 specimens of E-2 material and 1 of E-3, and 72 lots of buff and brown mica yielded only 68 specimens of E-2 and 13 of E-3. Yet 92 of the lots had been graded as No. 2; 5 as No. 1 and No. 2; and 14 as No. 2, No. 2 inferior, and No. 3. Most of the down grading apparently had been done on the basis of waviness and inclusions, but the spark testing showed that pinholes were present in 33 percent of the lots, hair cracks in 8 percent, and conducting impurities in more than 6 percent of the lots. The proportion of pieces in each lot so marred varied from 2 percent to 100 percent. The results of electrical tests of the sample lots that contain material of other than E-1 quality are listed separately in table 14.

The results of these comparisons fully support the conclusions of Coutlee, Townsend, and others who have pointed out that much mica ordinarily classed as No. 2 or No. 2 inferior by visual appraisal actually has excellent dielectric properties, as determined by means of the Q-meter. Moreover, the spark-coil test set provides a means for identification of conducting regions and tiny structural flaws that may well be more effective than even the most critical visual scrutiny. In its present form the Q-meter permits the testing of 15 to 20 pieces of mica per minute by a reasonably competent operator, the average rate depending in part upon the type of material under test and in part upon the period of time between rest pauses for the operator. The spark-coil test set permits much more rapid manipulations. Adaptation of the Q-meter to semi-automatic or even fully automatic operation appears entirely feasible and would appreciably lessen the cost of electrical testing.

TABLE 12.—*Test data for mica, taken from the production line of the Colonial Mica Corporation in 1945, previously qualified by visual means*

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Listed quality, determined by visual inspection	Electrical tests: Total number of pieces tested	Electrical tests: Percent E-1	Electrical tests: Percent E-2	Electrical tests: Percent E-3	Electrical tests: 30-mil stack (number of stacks in parentheses)	Proportion of tested defects (to nearest 5 percent): Material with conducting substances	Proportion of tested defects (to nearest 5 percent): Material with cracks	Proportion of tested defects (to nearest 5 percent): Material with pinholes
Burton	Buncombe	Buncombe, N. C.	4	Cinnamon brown	0	2 inf	117	100	0	0		0	0	0
Do	do	do	2	do	0	2 inf	165	100	0	0		0	0	0
Do	do	do	5	do	0	2 inf	321	100	0	0	E-1 (1)	0	0	0
Do	do	do	5½	do	0	2 inf	251	100	0	0		0	0	0
Do	do	do	2	do	0	2	191	100	0	0		0	0	0
Do	do	do	3	do	0	2	182	100	0	0		0	0	0
Do	do	do	4	do	0	2	154	100	0	0	E-1 (1)	0	0	0
Do	do	do	6	do	0	2	302	100	0	0		0	0	0
Do	do	do	5	do	0	2	190	100	0	0	E-1 (1)	0	0	0
Do	do	do	2	do	0	1	133	100	0	0		0	0	0
Do	do	do	3	do	0	1	127	100	0	0		0	0	0
Do	do	do	4	do	0	1	177	100	0	0	E-1 (1)	0	0	0
Do	do	do	5	do	0	1	153	100	0	0	E-1 (1)	0	0	0
Do	do	do	5½	do	0	2	139	100	0	0	E-1 (1)	0	0	0
Do	do	do	6	do	0	1	173	100	0	0	E-1 (1)	0	0	0
Corner Rock	do	do	5	do	0	2	163	100	0	0	E-1 (1)	0	0	0
Do	do	do	6	do	0	2	142	100	0	0	E-1 (1)	0	0	0
Eanes No. 2	Ridgeway-Sandy Ridge.	Henry, Va	4, 5, 6	Brown to cinnamon brown.	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	50	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	20
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	20	2 inf	200	100	0	0	E-1 (1)	0	10	10
Do	do	do	4, 5, 6	do	30	2 inf	200	100	0	0	E-1 (1)	0	10	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Houston	Franklin-Sylva	Macon, N. C	4, 5, 6	Cinnamon brown	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10

Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	20
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	50
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	50
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	50	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	10	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	20
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	15
Do	do	do	4, 5, 6	do	0	2 inf	248	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	25
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	50	0
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	75	50
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	10	0
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	75	10
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	100	50
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	100	0
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	50	100
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	100	10
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	75	50
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 5½	do	0	2 inf	180	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	100
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	50	100
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	100	0
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	100	0
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	20
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	15
Do	do	do	4, 5, 5½	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	25
Do	do	do	4, 5, 5½	do	0	2 inf	100	100	0	0	E-1 (1)	0	0	20
Iotla-Bowers (Iotla, Bowers).	do	do	4	do	0	1	140	100	0	0		0	0	0
Do	do	do	3	do	0	2	190	100	0	0		0	0	0
Do	do	do	1	do	0	2	195	100	0	0		0	0	0
Do	do	do	4	do	0	2	145	100	0	0		0	0	0
Do	do	do	3	do	0	2 inf	182	100	0	0		0	0	0
Do	do	do	2	do	0	2	235	100	0	0		0	0	0
Do	do	do	1	do	0	2 inf	197	100	0	0		0	0	0
Do	do	do	4	do	0	2 inf	115	100	0	0		0	0	0
Do	do	do	3	do	0	1	223	100	0	0		0	0	0
Do	do	do	1	do	0	1	159	100	0	0		0	0	0

TABLE 12.—*Test data for mica, taken from the production line of the Colonial Mica Corporation in 1945, previously qualified by visual means*—Continued

Name of mine or prospect	District	County and State	Type of material	Color	Proportion of material with mineral stain (to nearest 5 percent)	Listed quality, determined by visual inspection	Electrical tests: Total number of pieces tested	Percent E-1	Percent E-2	Percent E-3	30-mil stack (number of stacks in parentheses)	Proportion of tested defects (to nearest 5 percent): Material with conducting substances	Material with cracks	Material with pinholes
Liberty	Alabama	Randolph, Ala.	5, 6	do	0	2 inf	367	100	0	0	E-1 (1)	0	0	20
Do	do	do	5	do	10	2 inf	317	100	0	0	E-1 (1)	0	0	0
Do	do	do	6	do	25	3	169	100	0	0	E-1 (1)	0	0	10
Do	do	do	5½	do	50	3	133	100	0	0	E-1 (1)	25	0	0
Do	do	do	5½, 6	do	20	2 inf	412	100	0	0	E-1 (1)	0	0	10
Do	do	do	5½, 6	do	20	2 inf	439	100	0	0	E-1 (1)	0	0	5
Do	do	do	5½, 6	do	0	2 inf	300	100	0	0	E-1 (1)	0	0	20
Do	do	do	5½, 6	do	20	2 inf	425	100	0	0	E-1 (1)	0	0	20
Do	do	do	5½, 6	do	20	2 inf	400	100	0	0	E-1 (1)	0	0	5
Do	do	do	5½, 6	do	20	2 inf	425	100	0	0	E-1 (1)	0	0	20
Do	do	do	5½, 6	do	20	2 inf	400	100	0	0	E-1 (1)	0	0	5
Do	do	do	5½, 6	do	0	2 inf	425	100	0	0	E-1 (1)	0	0	10
Do	do	do	5½, 6	do	0	2 inf	410	100	0	0	E-1 (1)	0	0	20
Do	do	do	5½, 6	do	0	2 inf	405	100	0	0	E-1 (1)	0	0	10
Do	do	do	5½, 6	do	0	2 inf	400	100	0	0	E-1 (1)	0	0	5
Do	do	do	5½, 6	do	0	2 inf	310	100	0	0	E-1 (1)	0	0	20
Do	do	do	5½, 6	do	0	2	235	100	0	0	E-1 (1)	0	0	0
Do	do	do	5½, 6	do	0	2	300	100	0	0	E-1 (1)	0	0	0
Do	do	do	5½, 6	do	0	2	300	100	0	0	E-1 (1)	0	0	0
Do	do	do	5½, 6	do	0	2	300	100	0	0	E-1 (1)	0	0	0
Do	do	do	5½, 6	do	0	1	265	100	0	0	E-1 (1)	0	0	0
Miller Douglas	Shelby-Hickory	Caldwell, N. C.	6	do	0	2 inf	385	100	0	0		0	0	0
Do	do	do	5½	do	0	2 inf	188	100	0	0		0	0	0
Do	do	do	5	do	0	2 inf	193	100	0	0		0	0	0
Do	do	do	5½, 6	do	0	2	145	100	0	0		0	0	0
Do	do	do	5	do	0	2	128	100	0	0		0	0	0
Do	do	do	5, 6	do	0	1	133	100	0	0		0	0	0
Do	do	do	5, 6	do	0	1	142	100	0	0		0	0	0
Do	do	do	6	do	0	2	303	100	0	0		0	0	0
Do	do	do	6	do	0	1	365	100	0	0		0	0	0
Sheriff	Hartwell	Hart, Ga.	5, 5½, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	5, 5½, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	5, 5½, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	20
Do	do	do	5, 5½, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	5, 5½, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	5, 5½, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	5, 5½, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	20
Do	do	do	5, 5½, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	20
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	50
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	75
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	25
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5

Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	50
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	50
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	150	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	150	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	50
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	10
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	5
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Do	do	do	4, 5, 6	do	0	2 inf	200	100	0	0	E-1 (1)	0	0	0
Sluder	Buncombe	Buncombe, N. C.	6	do	20	1, 2	305	100	0	0	E-1 (1)	0	0	10
Do	do	do	6	do	20	1, 2	306	100	0	0	E-1 (1)	0	0	10

TABLE 13.—*Test data for mica (not identified by mine), taken from the production line of the Colonial Mica Corporation in 1943 and placed in storage, qualified by visual means in 1943*

Lot number	Type of material	Proportion of material with mineral stain (to nearest 5 percent)	Listed quality, determined by visual inspection	Electrical tests							
				Total number of pieces tested	Percent E-1	Percent E-2	Percent E-3	30-mil stack (number of stacks in parentheses)	Proportion of tested defects		
									Material with conducting substances	Material with cracks	Material with pinholes
1135	6	0	2	204	100	0	0		0	0	0
1137	6, 7	0	2	115	100	0	0		0	0	50
1138	6	0	2	109	100	0	0		0	0	0
1139	5, 5½, 6	0	2	100	100	0	0		0	0	0
1140	6, 7	0	2	108	99	1	0		0	0	0
1141	6, 7	0	2	104	100	0	0		0	0	0
1142	6, 7	0	1, 2	101	100	0	0		0	0	50
1143	6, 7	0	2	110	100	0	0		0	0	0
1144	6, 7	0	2	102	100	0	0		0	0	0
1145	6, 7	0	2	195	100	0	0		0	50	0
1146	5, 5½	0	2	100	100	0	0		0	0	0
1151	4	0	1	100	100	0	0		0	0	0
1155	6	0	1	100	100	0	0		0	0	0
1156	7	0	1	100	100	0	0		0	50	0
1158	5	0	1	199	100	0	0		0	5	0
1159	5½	0	1	100	100	0	0		0	0	3
1165	5, 6	0	2	140	100	0	0		0	0	30
1214	6	0	2	104	100	0	0		0	0	5
1215	6, 7	0	2	106	100	0	0	E-1 (1)	0	0	2
1216	6	0	2	114	100	0	0	E-1 (1)	0	0	2
1224	6	0	2	100	100	0	0		0	0	2
1231	6	0	2	100	100	0	0		25	0	0
1232	6	0	2	105	100	0	0		0	0	0
1234	6	0	2	105	100	0	0	E-1 (1)	50	0	0
1235	6	0	2	106	100	0	0		0	0	0
1236	5, 6	0	2	112	100	0	0	E-1 (1)	0	0	0
1237	6	0	2	106	100	0	0		0	0	25
1260	6, 7	0	2	100	100	0	0		0	0	0
1261	5, 6	0	2	100	100	0	0		0	0	5
1262	5½, 6	0	2	105	100	0	0	E-1 (1)	0	0	0
1263	5, 6	0	2	105	97	1	2	E-1 (1)	0	0	2
1264	5½, 6	20	2	100	100	0	0		0	0	0
1265	6	0	2	109	99	1	0		0	0	0
1266	5½, 6	10	2	120	100	0	0	E-1 (1)	0	0	5
1270	6	0	2	101	100	0	0		0	0	0
1271	5, 6	0	2	110	100	0	0		0	0	5
1272	5, 6	25	2	102	100	0	0		0	0	5
1273	5½, 6	0	2	195	100	0	0		0	5	0
1274	6, 7	0	2	105	100	0	0		0	0	5
1276	6	5	2	110	100	0	0	E-1 (1)	0	0	2
1280	6, 7	0	1, 2	128	100	0	0	E-1 (1)	0	0	0
1282	6	0	2	105	100	0	0		0	0	2
1285	6	0	2	103	100	0	0		0	0	0
1286	6	0	2	104	100	0	0		5	0	0
1287	6, 7	0	2	106	100	0	0	E-1 (1)	0	0	0
1288	5, 5½, 6	0	2	105	100	0	0		0	0	2
1289	6	0	2	121	100	0	0	E-1 (1)	0	0	0
1294	5, 6	0	2	192	100	0	0		0	0	0
1305	5, 5½	0	1, 2, 2 inf	199	100	0	0		0	0	2
1306	5½	0	2	105	100	0	0	E-1 (1)	0	0	2
1307	5½, 6	0	2	106	100	0	0	E-1 (1)	0	0	0
1308	6	0	2	105	100	0	0	E-1 (1)	0	0	2
1309	6, 7	0	2	103	100	0	0	E-1 (1)	0	0	0
1310	6	0	2	110	100	0	0		0	0	10
1311	5, 5½, 6	0	2	131	100	0	0	E-1 (1)	0	0	0
1312	5½, 6	0	2	116	100	0	0	E-1 (1)	10	0	0
1313	5, 6	0	2	133	100	0	0	E-1 (1)	0	0	0
1314	6	0	1, 2, 2 inf	106	100	0	0		20	0	0
1315	5, 6	0	1, 2, 2 inf	106	100	0	0		50	0	50
1316	6	0	2	113	100	0	0		0	0	0
1317	3, 4, 5	0	1, 2	150	100	0	0	E-1 (1)	0	0	0
1318	5	0	2	102	100	0	0		0	0	0
1319	5½, 6	0	1, 2	100	100	0	0		0	0	50
1320	6	0	2	106	100	0	0	E-1 (1)	0	0	0
1321	6	0	2	198	100	0	0		0	0	0
1322	5, 5½, 6	25	2	104	100	0	0	E-1 (1)	0	0	2
1323	5½, 6	0	2	105	100	0	0		0	0	5
1324	6	0	2	114	100	0	0		0	0	0
1325	5, 5½, 6	25	1, 2, 2 inf	145	99	1	0	E-1 (1)	0	5	0
1326	6, 7	0	2	107	100	0	0	E-1 (1)	0	0	5
1327	5, 5½, 6	0	2	108	100	0	0	E-1 (1)	0	0	5
1329	6	0	2	130	100	0	0	E-1 (1)	0	0	0
1337	6, 7	0	2	112	99	0	1	E-1 (1)	0	0	0
1338	6	0	2	101	100	0	0		0	0	0
1341	6	0	2	104	100	0	0	E-1 (1)	0	0	0
1343	6	0	2	105	100	0	0	E-1 (1)	0	0	10
1345	6	0	2	100	100	0	0		0	0	0
1346	6	0	2	118	100	0	0	E-1 (1)	0	0	5
1347	6	0	2	100	100	0	0		0	0	0
1348	6	0	2	106	100	0	0		0	0	5
1349	4, 5	0	1, 2	144	100	0	0	E-1 (1)	0	0	25
1369	5½, 6	0	2	109	98	2	0	E-1 (1)	0	0	0
1371	6	0	2, 2 inf	102	100	0	0	E-1 (1)	50	0	0
1376	6	0	1, 2, 2 inf	104	100	0	0	E-1 (1)	0	0	50
1377	5, 5½, 6	0	2	113	100	0	0	E-1 (1)	0	20	0
1378	6	0	2	184	100	0	0	E-1 (1)	0	0	0
1379	6	0	2	104	100	0	0	E-1 (1)	0	0	5
1381	6	0	2	115	100	0	0	E-1 (1)	0	0	0
1385	6	0	2	107	100	0	0	E-1 (1)	0	20	0
1386	5½, 6	0	2	107	100	0	0	E-1 (1)	0	0	0
1387	6	0	2	108	100	0	0	E-1 (1)	0	0	0
1388	6, 7	0	2	105	100	0	0	E-1 (1)	0	0	0
1389	6	0	2	106	100	0	0	E-1 (1)	0	0	10
1390	6, 7	0	2	106	100	0	0	E-1 (1)	0	0	0
1391	6, 7	0	2	100	100	0	0		0	0	0

TABLE 13.—*Test data for mica (not identified by mine), taken from the production line of the Colonial Mica Corporation in 1943 and placed in storage, qualified by visual means in 1943*—Continued

Lot number	Type of material	Proportion of material with mineral stain (to nearest 5 percent)	Listed quality, determined by visual inspection	Electrical tests							
				Total number of pieces tested	Percent E-1	Percent E-2	Percent E-3	30-mil stack (number of stacks in parentheses)	Proportion of tested defects		
									Material with conducting substances	Material with cracks	Material with pinholes
1392	6, 7	0	2	100	100	0	0		0	0	0
1393	5½, 6	0	2	109	100	0	0	E-1 (1)	0	0	0
1400	6, 7	0	2	100	100	0	0		0	0	0
1404	4, 5, 6	0	2, 2 inf., 3	108	100	0	0	E-1 (1)	0	0	0
1405	5, 6	0	2	101	100	0	0		0	0	0
1406	5, 6	0	2	100	100	0	0		0	20	0
1407	5, 6	0	2	103	100	0	0	E-1 (1)	0	0	0
1408	4, 5, 6	0	2	116	100	0	0	E-1 (1)	0	0	20
1409	5, 6	0	2	102	100	0	0	E-1 (1)	0	0	0
1410	5, 6	0	2	108	100	0	0	E-1 (1)	0	20	0
1411	5, 6	0	2	100	100	0	0		0	0	0
1412	5, 6	0	2	105	100	0	0	E-1 (1)	0	0	0
1413	5, 6	0	2	107	100	0	0	E-1 (1)	0	0	0
1414	5, 6	0	2	110	100	0	0	E-1 (1)	0	0	5
1415	5, 6	0	2	113	100	0	0	E-1 (1)	0	0	0
1416	5, 6	0	2	101	100	0	0		0	0	0

TABLE 14.—*Results of electrical tests of mica samples, taken from the production line of the Colonial Mica Corporation in 1943, that include material of E-2 or E-3 quality*

Mine lot No.	Type of material	Proportion of material with mineral stain (to nearest 5 percent)	Listed quality, determined by visual inspection	Number of pieces tested	Percent E-2	Percent E-3	Proportion of tested defects		
							Material with conducting substances	Material with cracks	Material with pinholes
1263	5, 6	0	2	105	1	2	0	0	2
1265	6	0	2	109	1	0	0	0	0
1325	5–6	25	1, 2, and 2 inf	145	1	0	0	5	0
1337	6, 7	0	2	112	0	1	0	0	0
1369	5½, 6	0	2	109	2	0	0	0	0

SUMMARY AND CONCLUSIONS

The results of the color tests show that Southeastern muscovite ranges from buff and drab through shades of brown and green to pale yellowish green. Most books are not colored uniformly throughout, and both irregular and several types of regular variations are known. Buff and brownish ("ruby") mica is most abundant in the Piedmont province and in large parts of the Franklin-Sylva, Spruce Pine, and Jefferson-Boone districts of the Blue Ridge province, but in general the bulk of the sheet material produced from the entire Southeast region is yellowish or brownish olive.

Systematic color variations occur within some mica shoots, within single pegmatite bodies, and within large groups of pegmatite bodies. Variations in individual mica books and within single mica shoots are most pronounced where the muscovite is green and yellowish olive. On a larger scale, brownish books generally are nearer the walls of a given pegmatite body than green ones, and no brownish books occur in those pegmatites with green wall-zone mica. Green books are rare in pegmatites with core-margin or other interior concentrations of brownish mica.

A substantial proportion of Southeastern muscovite is mineral-stained; that is, it contains specks, spots, or broader masses of hematite, magnetite, or biotite. Much hematite also occurs as latticelike intergrowths of triangular or rectangular pattern. Little mineral stain can be effectively removed by careful splitting, owing to the extreme thinness of the foreign masses. In marked contrast are thicker and larger inclusions of euhedral biotite and such "stony" minerals as apatite, garnet, pyrite and other sulfides, quartz, tourmaline, zircon, and zoisite. Such inclusions can be removed with little difficulty; when this is done, holes or distinct depressions are left in the host muscovite. Other types of foreign matter, mainly mottled to curdy pale-greenish or brownish stain, are widespread and locally very abundant. Clay stains and supergene iron and manganese stains are very abundant also, but air-stained mica is rare in the Southeastern deposits.

Iron oxide mineral stains are common in brownish and yellowish-olive micas but are rare in those that are buff or brown. Thin shreds and wisps of biotite are common in muscovite of nearly all colors, whereas the coarse, euhedral type of biotite occurs almost wholly in buff and brown muscovite. Mottling, "vegetable stain," and similar impurities are present in nearly all types of muscovite. In general, mineral-stained mica is confined to the outer parts of those pegmatite bodies that also contain clear greenish books and to the inner parts of those that also contain clear buff or brown books.

Pinholes appear to be developed in Southeastern muscovite by the "popping out" of tiny inclusions of zircon, apatite, garnet, and other "stony" minerals during splitting of the host books. They are not uncommon in most districts but are abundant in the mica from only a few mines. Most occur in brown and buff, or ruby, micas, in which zircon and apatite inclusions are most abundant. Hair cracks, said to develop in part after rifting and trimming of sheet mica from certain deposits, are more numerous in greenish micas than in the brown and buff varieties. They are especially common in the yellowish-olive books from several mines in the Spruce Pine district.

The results of the electrical tests are similar in many respects to those of several earlier testing programs,[85] and the detailed study of 237,764 pieces specifically identified with at least 850 deposits gives them additional statistical value. The correlation between power factor and physical appearance suggested by Kesler and Olson [86] holds in a general way, but evidently there are numerous exceptions, particularly among stained micas. Nearly all these exceptions lie in one direction, however, in that the power factor of such mica is lower than that expectable on the basis of visual appearance alone.

There appears to be a partial correlation between power factor and the amount of hematite-magnetite stain in sheet mica, in that most test pieces of E–2 and E–3 electrical quality were heavily stained. On the other hand, many other pieces of heavily stained mica tested E–1, and some perfectly clear pieces tested E–2 and E–3.[87] Careful inspection has demonstrated that E–1 stained mica cannot be distinguished from E–3 stained mica by ordinary visual means. In general, however, much muscovite that contains substantial quantities of iron—either as inclusions, as exsolved intergrowths, or in solid solution—has distinctly less desirable electrical properties than iron-poor varieties.

Green and brown mottling, "vegetable stain," wispy to platy inclusions of green and brown biotite, and some clay stains that do not transgress the laminae of the host mica appear to have little adverse effect upon its power factor. Air stain also was found to have no effect in the few test pieces with this feature, although appreciable increase in power factor due to air bubbles in mica has been demonstrated by Hall [88] at a frequency of 1,000 kilocycles.

Evidently neither the color nor the depth of color in clear muscovite has any definite relation to its power factor. This is in full agreement with the findings of Hall,[89] Coutlee,[90] and others [91] and is contrary to the oft-repeated assertion that green and dark-colored varieties have basically inferior electrical characteristics.[92] The clear green, yellowish-olive, and brownish-olive micas, both light and dark, were found to lie within essentially the same power-factor range as the pinkish-buff and light-brown, or ruby, varieties. If, however, all greenish muscovite is considered without regard to whether or not it is mineral-stained, its general dielectric properties are distinctly inferior to those of the other types, simply because damaging mineral stain is much more common in such mica. This very important point is summarized by the American Society for Testing Materials [93] as follows:

> Experience has shown that the *Q* value range of ruby and white types of block mica, regardless of source, is 80 to 95 per cent E-1, whereas, the *Q* value range of light green, dark green, greenish brown, and rum-colored block mica is 45 to 90 per cent E-1. It is important to bear in mind that it is permissible for all qualities of mica prescribed in A. S. T. M. Specifications D 748, to contain spots and stains, providing the mica meets all electrical and physical requirements, whereas, no spots or stains (other than air stains) are permitted in the * * * visual quality groups per A. S. T. M. Methods D 351.

It should be recognized that power factor alone does not determine the applicability of a given piece of mica for condenser or other high-grade uses. The mica must meet other physical requirements, hence must also be tested visually and with the spark-coil set. Tightly intergrown plates and wisps of biotite, for example, have little effect upon the power factor of block muscovite, yet they may well interfere seri-

[85] Kesler, T. L., and Olson, J. C., Muscovite in the Spruce Pine district, N. C.: U. S. Geol. Survey Bull. 936–A, pp. 18–30, 1942; Horton, F. W., Mica: U. S. Bur. Mines Inf. Circ. 6822, pp. 41–46, 54–55, 1935 (revised 1941); Hall, E. L., Equipment and method for measurement of power factor of mica: Inst. Radio Eng. Proc., vol. 32, p. 396, 1944; Townsend, J. R., Final report on commercialization of mica testing equipment: War Metallurgy Comm., War Production Board Rept. W–151, pp. 21–25, 1944; Coutlee, K. G., Judging mica quality electrically: Am. Inst. Electrical Eng. Trans., vol. 64, pp. 5–7, 1945.

[86] Kesler, T. L., and Olson, J. C., op. cit., p. 18.

[87] Hall, E. L., Equipment and method for measurement of power factor of mica: Inst. Radio Eng. Proc., vol. 32, p. 396, 1944; Coutlee, K. G., Saving mica by testing: Bell Lab. Rec., vol. 22, p. 513, 1944.

[88] Olson, J. C., Mica-bearing pegmatites of New Hampshire: U. S. Geol. Survey Bull. 941–P, p. 382, 1942.

[89] Hall, E. L., Equipment and method for measurement of power factor of mica: Inst. Radio Eng. Proc., vol. 32, p. 396, 1944.

[90] Coutlee, K. G., Judging mica quality electrically: Am. Inst. Electrical Eng. Trans., vol. 64, pp. 1, 7, 1945.

[91] American Society for Testing Materials, Tentative specifications for natural block mica and mica films suitable for use in fixed mica-dielectric capacitors, A. S. T. M. Designation: D 748–45T: 1946 Book of A. S. T. M. Standards, pt. 3–B, p. 705, 1947.

[92] Horton, F. W., Mica: U. S. Bur. Mines Inf. Circ. 6822, p. 22, 1935 (revised 1941); Gwinn, G. R., Strategic mica: U. S. Bur. Mines Inf. Circ. 7258, p. 3, 1943; Judd, D. B., Color standard for ruby mica: Nat. Bur. Standards Jour. Research, vol. 35, p. 245, 1945.

[93] American Society for Testing Materials, Tentative specifications for natural block mica and mica films suitable for use in fixed mica-dielectric capacitors, A. S. T. M. Designation: D 748–45T: 1946 Book of A. S. T. M. Standards, p. 3–B, p. 717, 1947.

ously with its filming properties or lead to development of cracks and holes in finished films. Pinholes, hair cracks, and conducting impurities are particularly objectionable. Reeves, warping, rippling, or other structural imperfections may lead to undesirably high proportions of waste during the final stages of mica preparation, even though the electrical properties of the mica are perfectly satisfactory for condenser use.[94]

It was demonstrated more than a decade ago that domestic muscovite compares favorably with India muscovite, quality for quality, in dielectric strength, changes on heating, power factor, flexibility, and hardness,[95] and it generally has been assumed that most consumers' preference for India mica is based upon its more careful preparation and better grading. Through the efforts of the Colonial Mica Corporation during the period of World War II, however, the preparation of domestic mica was standardized and greatly improved, and consumers were able to use large quantities of such material without further testing. Moreover, the results of the present investigations show that there is no intrinsic difference, quality for quality, between clear ruby and clear nonruby micas from the Southeastern States. Clear green, yellowish-olive, and brownish-olive micas, selected by visual means, should prove just as satisfactory for condenser use as clear buff and light-brown micas, and several manufacturers have indeed found this to be the case. In addition, the use of electrical testing and adoption of the combined visual-electrical system of mica classification should result in upward grading of much sheet material from the Southeastern States and might well go even farther toward improving the currently inferior position of the abundant greenish varieties in the trade. Electrical testing might also force rejection of some sheets and lots of apparently high-quality material, owing to pinholes or other defects difficult to recognize.

Although possibilities for the use of visually inferior grades of mica in condensers have been pointed out, the requisite electrical testing and increasing costs of preparation might well exceed the potential gains from such a procedure, especially under peacetime conditions. In discussing the mica situation in 1944, Gwinn and Tucker [96] noted that "by the end of the third quarter the supply and stock of strategic mica, especially the smaller sizes, reached such a point that the War Production Board felt it no longer necessary to purchase either domestic or imported green- and black-stained mica. This curtailment was instituted to eliminate the excessive handling and preparation costs entailed in preparing green- and black-stained material." Although perfectly accurate with respect to black-stained mica, this statement—like many another in the published record—is not at all clear with respect to green material. The use of a hyphen after the word "green" implies that mica with green stain is intended, whereas the decision of the War Production Board applied to all green mica (or, more exactly, to all nonruby mica), whether stained or clear. There appears to be no good evidence that clear green muscovite is any more difficult or expensive to handle and prepare, grade for grade, than clear muscovite of any other color.

Some of the economic factors involved in the use of electrical testing for the upgrading of visually low-quality mica have been summarized by Watts,[97] who points out that the cost will be increased by (1) the expense of selecting the mica; (2) losses involved in the rejection of E–2 or E–3 mica or of mica with conducting impurities; (3) additional rejections in the voltage testing of films for large-capacity or potted-type condensers; (4) difficulty in splitting and punching some types of mica; (5) the additional inspection and care required in manufacture; and (6) the greater number of rejected capacitors. He adds that electrically selected low-quality (visually determined) ruby or green mica can be used to produce satisfactory capacitors and that if the industry were "to use the lower qualities when sufficient higher qualities were obtainable, the anomalous situation of greater cost for capacitors made with lower quality mica than higher quality mica would result."

It has been established that much mineral-stained mica is not as readily split and filmed as the clear varieties,[98] hence that its preparation is more time consuming and involves somewhat greater losses of material. No such difference, however, has been demonstrated between clear micas of different colors.

The grading of mica according to the combined visual-electrical method proposed by the American Society for Testing Materials should result in a substantial conservation of sheet material of condenser quality. This saving, which might well amount to as much as 60 percent,[99] would be particularly important during periods of short supply, especially with respect to clear sheet stock. At other times, however, competition with foreign sources of supply, with ceramic, glass, treated paper, and plastic substitutes,

[94] Coutlee, K. G., Judging mica quality electrically: Am. Inst. Electrical Eng. Trans., vol. 64, p. 7, 1945.

[95] Horton, F. W., Mica: U. S. Bur. Mines Inf. Circ. 6822, p. 54, 1935 (revised 1941).

[96] Gwinn, G. R., and Tucker, E. M., Mica, in Minerals Yearbook for 1944, p. 1470, U. S. Bur. Mines, 1946.

[97] Watts, F. F., Notes on NRC–537, in Townsend, J. R., Addendum to War Metallurgy Comm. Rept. W–151: War Production Board Rept. W–170, pp. 1–2, 1944.

[98] Coutlee, K. G., Judging mica quality electrically: Am. Inst. Electrical Eng. Trans., vol. 64, pp. 6–7, 1945; Watts, F. F., Notes on NRC–537, in Townsend, J. R., Addendum to War Metallurgy Comm. Rept. W–151: War Production Board Rept. W–170, p. 3, 1944.

[99] Coutlee, K. G., Saving mica by testing: Bell Lab. Rec., vol. 22, p. 513, 1944.

and even with synthetic mica [100] might well be so great that piece-by-piece electrical testing would not be economically feasible as a means for bringing visually inferior grades of domestic mica into the field of condenser use. As pointed out by Watts,[101] though, "the use of the instruments by industry need not be confined to selecting the better micas from the lower qualities. They are being used to check shipments, evaluate mica from untried sources and for selection of the highest electrical quality from high-quality mica. In the event that the industry adopts A.S.T.M.-D748-43T, their use would become mandatory." Moreover, improvements in the design of the Q-meter and spark-coil test set are to be expected, and these devices probably will be adapted to continuous semi-automatic or fully automatic operation, either for piece-by-piece or for sample-lot testing.

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[100] Spence, H. S., Mica as a critical war mineral: Canadian Min. Jour., vol. 67, pp. 4-5, 1946.

[101] Watts, F. F., Notes on NRC-537, in Townsend, J. R., Addendum to War Metallurgy Comm. Rept. W-151: War Production Board Rept. W-170, p. 2, 1944.

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